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THE MECHANICAL CAUSE OF FOLDS IN THE APERTURE OF THE SHELL OF GASTEROPODA.[1]

BY WM. H. DALL.

The folds which are frequently present on the columella and the lip of the aperture of the shells of Gasteropoda, may, I think, be traced to a mechanical cause. In considering the dynamic relations of the animal to its shell we may obtain satisfaction on this point. In the fusiform rachiglossa an anatomical difference exists to which I believe attention has not hitherto been called. Indeed, unless the principles of dynamic evolution are granted it is a difference which would appear to have little or no significance. These principles, however, afford a key which seems to unlock this and many other mysteries. In the plicate forms of this sort the adductor muscle, which in all gastropods is attached to the columella at a certain distance within the aperture, is attached *deeper within the shell* than in non-plicate forms. The point of attachment may be an entire turn, or even more, behind the aperture, while in short globose few-whorled shells and in the non-plicate forms it is, as a general rule, little more than half a turn within the aperture.

[1]Adapted from the Transactions of the Wagner Free Institute of Science, Philadelphia, Vol. III, 1890, p. 58.

Now let us consider the dynamics of the case. We have, reduced to its ultimate terms, a twisted shelly, hollow cone, sub-angulate or even channelled at two extremes corresponding to the canal and the posterior commissure of the body and outer lip. Inside of this we have a thin, loose epithelial cone, the mantle, of which the external surface especially toward the margin, is shell-secreting; lastly, inside of the mantle-cone we have a more or less solid third cone, consisting of the foot and other external parts of the body of the animal, which can be extended beyond the mantle-cone outwardly, as the mantle-cone can be beyond the shell-cone. The body-cone and the mantle-cone are attached at one of the angles of the shell-cone some distance within the opening of the spiral of the latter. The two outer cones constitute a loose, flexible funnel within a rigid, inflexible funnel, while the body-cone forms a solid, elastic stopper inside of all.

What will happen according to mechanical principles (which can be tested by any body with the simplest apparatus) when the mantle-cone is withdrawn into a part of the shell-cone too small for the natural diameter of the contracted mantle-cone? It must wrinkle longitudinally. Where will the wrinkles come? They will come at the angles of the shell-cone first; they will be most numerous toward the aperture, since toward the aperture the mantle-cone enlarges disproportionately to the caliber of the shell, owing to its processes, the natural fold of the canal, etc., etc.; the deepest and strongest wrinkles will be over the pillar, owing to the fact that the attachment of the adductor prevents perfect freedom in wrinkling, and the groove of the canal will mechanically induce the first fold in that vicinity. The most numerous small wrinkles will be near the aperture opposite the pillar, because of the mantle-edge this is the most expanded part, and there will be a tendency to a ridge near the angle of the posterior commissure. Repeated dragging of a shell-secreting surface, thus wrinkled, over a surface fitted to receive such secretion, will result in the elevated shelly ridges which on the pillar we call plications, and on the outer lip liræ, if long, or teeth if short. The commonly existing subsutural internal ridge on

the body of the shell near the posterior commissure will mark the special conditions in that part of the aperture.

When the secreting surface is thus wrinkled or corrugated longitudinally the wrinkles and the concave folds between them will be directed in the sense or direction in which the body moves in emerging from or withdrawing to the whorl. The summits of the convex wrinkles will be appressed more or less forcibly against the shell-wall exterior to them in which they are contained. The semi-fluid, living secretion of which the shell-lining is built up, exuding from the whole surface of the mantle, will be rubbed away from the lines of the summits of the wrinkles and tend to accumulate in lines corresponding to the concave furrows between the wrinkles. This secretion hardens rapidly, and these lines would become somewhat elevated ridges which would by their presence (when once initiated) tend to maintain the furrows and wrinkles in the same place with relation to the thus-initiated liræ, as these elevated lines are called when on the outer lip; or plaits, when situated on the pillar.

The modification referred to generally takes place during resting stages of the animals' growth, since while the animal is rapidly extending its coil the secretions seem to be concentrated along the mantle margin, while the general mantle-surface resumes its secretive function (or the latter becomes active) somewhat later, after the formation of a definite shelly varix, or thickened margin, indicating a resting stage in the animal's career. It is probable also that during rapid growth there is less compression of the tissues than during the resting stages. The external sculpture and some of the modifications of the aperture are connected with the functions of the extreme edge of the mantle; those we are at present considering relate more especially to the function of its general surface by which the layer which lines the whorls, the pillar, plaits and liræ are solely secreted and deposited.

In species with the adductor muscle attached to the pillar near the aperture the wrinkles would be fewer, and their action, if any, confined to the vicinity of the margin of the aperture. The deeper the attachment the greater will be the

compression of the secreting surface and the distance over which it is constantly dragged back and forth, and the consequent length of the ridges of shelly matter deposited. If the inner or mantle-cone had the whole cavity to itself, it is evident that it could and would infold itself in a manner which might not appress its folds against the inner surface of the rigid outer or shell-cone. But there the mass of the solid and elastic foot and external body comes into play, and by its withdrawal inward forces the wrinkled mantle-cone against the shell. The mantle is thus confined between a rigid outer and

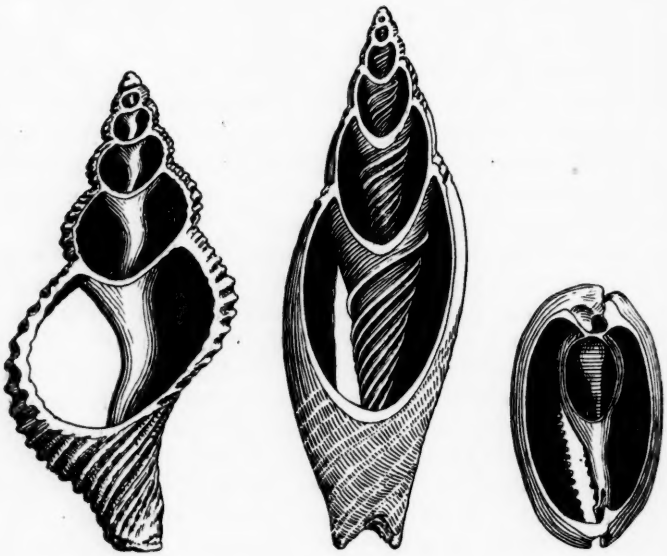

Fig. 1. Fig 2. Fig. 3.

Fig. 1. *Fusus parilis* Conr. a gastropod in which the caliber of the spire contracts uniformly within the aperture but which, having a short retractor muscle develops no plications on the axis.

Fig. 2. *Mitra lineolata* Heilprin, a gastropod otherwise similar, but in which the retractor is long and deep seated and in which the axis becomes plicated.

Fig. 3. *Siphocypræa problematica* Heilprin, a gastropod in which the aperture is contracted and the cavity within ample so that plications are developed on the sides of the aperture but not on the axis within.

an elastic inner surface, with the result that it cannot recoil from the former and that a certain uniformity of size and direction is imposed upon the wrinkles, except where the recess of the canal allows them to become more emphatic, or to a less degree, the posterior angle permits a slight expansion. The mechanical principles involved may be readily illustrated by the experiment of pulling a handkerchief through the neck of a bottle, or funnel, followed by a cork in the center. Of course, the more nearly the apparatus conforms to the form and twist of a spiral shell the more nearly the results will approximate to those of nature. It is difficult, however, to find any artificial tissue which will correspond in elasticity, or capacity for partial self-contraction, to the living tissues concerned in nature. Hence an exact conformity is not to be expected though the mechanical principles may be reasonably well illustrated.

A comparison of specimens will show that the results exhibited agree with marvellous precision with the results called for by the preceeding hypothesis, based on the dynamical status of the bodies concerned, their motions and secretions. The agreement is so complete as to amount to a demonstration, though in certain cases there may be complications which need additional explanation.

A point which may be noted in regard to the Volutidæ, to which my attention was called by Mr. Pilsbry, is that in this group the mantle is greatly extended and there would be more of it to be wrinkled than in such forms as Buccinum, etc. It may be added that the forms in which we note the beginning of plaits for this family, many of them, such as Liopeplum and Volutomorpha, had the mantle so extended as to deposit a coat of enamel over the whole shell, as in the modern Cypræa, so that here we have an additional reason why plication should be emphasized in this group.

Of course, as before noted, the mechanical principles are the same in any group of gastropods, but among those in which the wrinkling is confined to the region of the aperture or those shells which are lirate or dentate as opposed to plicate, several other principles come into play which may be briefly referred

to in passing. In the first place, those species which have a very extended mantle, with hardly an exception have a lirate aperture (*Oliva, Olivella, Cypræa, Trivia*, etc.). With species in which there is a widely extended mantle and yet no liratiions, it will usually be found that the mantle is not entirely withdrawn into the shell in such forms, or is permanently external to the shell (many *Opisthobranchiata, Marseniidæ, Sigaretus, Harpa*, etc.). In a group, like the *Cypræidæ*, where nearly all the species are lirate on both lips, there are a few which want these liræ, and these are species which have a wider aperture in the adult than most of the genus, and in which we should expect the wrinkles to be less emphatic.

SOME BIRDS OF PARADISE FROM NEW GUINEA.

By Geo. S. Mead.

Of that class of the feathered creation to which the term Birds of Paradise has been applied, and which they certainly most appropriately bear, New Guinea with its adjacent islands is the home, or at least the greater number of the dozen or more species of this unrivalled family belong to these regions. Mr. Wallace, a recognized authority on these birds, as well as on the Malay Archipelago, seems to limit their range to the northern side of the mainland. Other travellers, however, have found them on the southern side, as well as in other parts of New Guinea. The Italian naturalist, D'Albertis, for example, encountered several species, notably *Paradisea raggiana*, along the Fly River—a large stream flowing southeast from the mountains of the interior and emptying into the Gulf of Papua, to the right of Torres Straits.[1]

Yet the northern side, as Mr. Wallace points out, certainly presents as safe a retreat as could be found for these lovely and much prized treasures of the feathered world. Impenetrable swamps, the rugged coast, impassable mountain ranges, fierce tribes of natives, illimitable forests—all these and other barriers are so many means of protection which it is to be hoped will long preserve a wild life that possesses the fatal gift of beauty, against utter extermination.

There is nothing perhaps but physical difficulties or the subsidence of a fashion that can save birds of paradise from the destruction which a barbarous propensity, and the careless

[1] "On the south coast of N. G. the vegetation is generally of the most luxuriant character, even for the tropics. One vast dark jungle spreads over its muddy shores, abounding in immense forest trees, whose trunks are hidden by groves of sago palms, and myriads of other heat and moisture-loving plants. Unlike the eastern and southern coasts of N. G., the northwestern part is described as being generally covered with timber, but having no underwood or dense jungle, so that it is very easy travelling under the shade of the lofty trees. The country is said to abound with small fresh-water streams, and patches of good grass." Polynesia, p. 175.

cruelty of women seem to make inevitable. Nature herself, therefore, must shield her own from the complacent notion that everything living is subservient to the whim or caprice of civilization or to the savage who ignorantly ministers to it.

These favored regions, besides those of the Aru Islands, where birds of paradise also abound, are rich in vegetation beyond even the usual fecundity of the tropics. Almost as unique, varied and lovely, are other forms of animal life—butterflies, dragon-flies, lizards, insects great and small, and countless tribes of the feathered race.

In the eyes of lovers of the gorgeous, among birds the king bird of paradise, *Cicinnurus regius*, is without a rival. It is indeed of surpassing loveliness, if, as some one says, an adjective so distinctive can properly be applied to any species when all are so lovely. The bird itself is of small size, nor does the plumage stand forth to that extent it reaches in other species, but within this compass the most perfect, soft and dazzling effects of delicate tints are displayed. While the plumage of all the birds of paradise is singularly beautiful, still more beautiful and magical is the play of shifting lights. The least movement on the part of the bird, the slightest displacement of a feather, the turning of a leaf or the letting in of a sunbeam, produces a wondrous and entrancing change. After death the colors pale, in many instances almost immediately, and of course the evanescent hues lose their startling brilliancy. Over the prevailing tint of red on the king bird, "a gloss as of spun glass wavers." The head is of deep orange, the throat cinnabar, the breast snow-white; between the breast and throat is a dividing belt of rich green. Like silk with its sheen and softness is the white breast; white also is seen over each eye. On either side of the lead-colored legs, at times hidden under the wings, tufted, white-tipped feathers, puffed out like the down on the soft powder-brushes ladies use, are to be noted, for they form a curious adjunct to the dress of the male bird. From the tail-feathers a pair of wire-feathers, five or six inches long, project; these are separated at their ends by an equal distance, and are webbed outwardly so as to form two circlets about the size of a coat-button. Capt. Moresby, in his inter-

esting book, "Discoveries in New Guinea," gives so admirable a description of the king-bird of paradise as to deserve quotation here:

"This bird," he says, "is as large as a small thrush, the back glossy crimson, the head feathers being soft, and deep in tone like velvet, the throat crimson, and separated from the pure white breast by the wide band of green. It has the long wire tail of all birds of paradise, terminating, however, in two circular feathers, about the size of a sixpenny piece, of a burnished green. But its peerless ornaments are two small feather fans of intense emerald color, set in the upper joint of the wing, and capable of being spread or folded at pleasure."

Not unlike the best known of all the birds of paradise, *P. apoda*, is the red-bird, *Paradisea sanguinea*. It cannot, however, be considered as the peer in beauty, its resemblance consisting chiefly in the fall of long plumes from the back, giving that appearance, so characteristic and so attractive, as of a cataract of feathers falling in a maze of wavy lines and spray. Where these soft plumes are golden in *Apoda* the red-bird has a deep crimson. Yellow prevails on the head and neck, extending a short distance on the back. A yellow band passes across the breast, flanked by green and brown. All these tints blend into each other, the line of division never being closely marked excepting on the throat. A corrugated arrangement of short velvety feathers gives a singular appearance to the head; this and the long filaments reaching beyond the loose wing plumage serve in making it one of the most striking ornaments of the bird creation.

The size of *Sanguinea* or *Rubra* is about that of a robin, perhaps a little larger, and its favorite resort the recesses of Waigiou Islands.

Paradisea apoda, the great paradise bird, has become a familiar object of admiration in museums of natural history and collections. In no other bird is the coloring so rich and the blending of browns, purple, green and orange so alluringly beautiful. Add to this the long, curving fall of plumes behind, and one of the most entrancing spectacles animate nature has to show is vouchsafed.

This is the species early brought to Europe by travellers, and even made an object of commerce. No wonder that, deprived of its sturdy, somewhat ugly legs and feet, people fabled the lovely creature to be not of earth but aerial, never settling on gross, material things, nor living on terrestrial food, but passing its halcyon existence above mundane growths, or like matchless Belinda's lock, wafted to the skies:

> "A sudden star, it shot through liquid air,
> And drew behind a radiant trail of hair."

Which last line, it has always seemed to me, fairly well describes the appearance of a shafted bird of paradise while in flight.

In his travels along the Fly River, N. G., in 1872–5, D'Albertis found (what he considered new to science) *Paradisea raggiana*, so named by Mr. Sclater, after Marquis Raggi, of Genoa. This beautiful bird of paradise the Italian explorer described by its differences from *P. apoda* and *P. minor* rather than by any special marks of its own. It is less in size than the great-bird, but in luxuriance of plumage almost its equal. In opulence of colors, too, it vies with the loveliest. A golden belt widening above divides the green throat from the ruby breast; a splash of the same color appears on the wings, while the back is untinged. Red prevails on the side wings running along the floating plumes. It is very probable that *P. apoda* and *P. raggiana* interbreed; possibly other varieties. D'Albertis notes several evident instances of hybrids, and names the characteristic markings of those specified—the yellowish tinge at the back of the throat, the small wing feathers banded with gold, etc. The velvety softness of the feathers is as observable in *Raggiana* as in all birds of paradise, while the exquisite intermingling or suffusion of vivid colors, although at the same time these are quite distinct, is just as inimitable. Long, curving wire-shafts adorn this species also.

Of less flaming colors than the last mentioned species, although the transition of hues is even still more wonderful, and lacking the flowing train of plumes and caudal appendages of other members of its kind, the *Lophorhina superba* or

atra hardly falls behind its congeners in beauty and attractiveness. Instead of the radiant splendor of the *Apoda* or *Raggiana*, the colors of *Superba* are darker but marvellously rich, —purple, violet, green, bronze, blue—ever varying and shifting in changing lights, the whole shot over with satin sheen, while silken gleams run fitfully along the compact feathers which, nevertheless, never lose their velvety softness. While to compensate for waving plumes, we have a gorgeous green bifurcated shield for the breast and two pseudo wings or wing coverings raised or depressed at will. The head glistens as with scales of dark green or blue, according to the reflections. It is not without the singular crests or protuberances which distinguish certain birds of this family, and it is not unlikely that the feathers are at times also erected when the bird is excited or pleased.

The unique adornment, however, of *Superba*, not omitting the curious extensions of metallic green athwart the breast, is the half-united pair of mock wings spreading out when raised, from the shoulders above the head and shadowing the back and sides. The color is black, but blazing with lustre, so that as the light strikes the tips of the feathers they become bronze or blue, or even green, almost iridescent, always resplendent. In size, shape and indescribable coloring, this mantle forms one of the most remarkable combinations of feathers which even a bird of paradise can show, this, too, on a little creature not more than nine inches in entire length.

D'Albertis informs us that the natives of New Guinea call the bird *niedda*, "from the sound of its notes." If this is so, its voice is materially different from the discordant cry of other *Paradisea*.

We hear from the incomparable emerald bird of paradise (*Apoda*), for instance, only a hoarse "wok, wok," or a succession of cawing, unmusical sounds.

In the Golden bird of paradise, *Paradisea sexetacea* or *Parotia sefilata*, we find another example of dark, rich clothing in contradistinction to the gay apparel of other species of the race. The somewhat misleading appellation, golden, is derived from the flashing colors of the gorget or escutcheon

below the throat. The rest of the bird is invested in more neutral tones—black, purple, bronze and green—lighting up into metallic brightness or deepening into dark, funereal velvet with every movement.

As the superb-bird is glorious with great shoulder-crests waving like a duplicated fan, and a two-fold breast shield, so the Golden has its own peculiar mark of uniqueness in the six long threadlike shafts projecting, three on either side, from the head, and terminating in an oval web. These wire feathers are movable and can be thrust at pleasure straight out or thrown back upon the body. The head is still further ornamented with the usual erectile feathers brushed back, as it were, from the beak; some gray in coloring or white shine like jewels or precious stones. On the sides, soft, massive pectoral plumes, jet black, pass beyond and over the wings, covering them when lowered and almost concealing the rounded tail as well.

EXPLANATION OF PLATES.

PLATE XXIX. From Brehm's Thierreich.

Fig. 1. *Paradisea apoda.*
Fig. 2. *Parotia sefilata.*
Fig. 3. *Cicinnurus regius.*

PLATE XXX. From Brehm's Thierreich.

Seleucides alba.

PLATE XXXI.

Paradisea raggiana Scl. from the Natural History of New Guinea.

THE PSYCHOLOGY OF HYPNOTISM.

By Jas. Weir, Jr., M. D.

The various phenomena accompanying animal magnetism, so-called, have been observed and commented on by man since a very early era in his history. Our savage ancestors, whose psychical development had just begun, considered these manifestations to be a direct evidence of the supernatural, and those individuals who, either actively or passively, gave evidences of this, to them, occult power, to be directly influenced by supernatural agencies. This manner of regarding these phenomena has, in a measure, descended to us, and the vast majority of civilized beings of to-day look with a certain awe on the person who is laboring under hypnotic influence. The sceptical minority, however, generally regard hypnotism as a baseless fraud and imposture. Both classes of individuals are in error; the first, because there is nothing supernatural in the phenomena of so-called animal magnetism; the second because these phenomena really do exist and are the result of perfectly natural causes. The term, animal magnetism, owes its origin to a tradition which came into existence about the middle of the sixteenth century. At that time, man conceived the idea that he could influence his fellows in a manner analogous to that of a magnet, attracting some, and repelling others. The first written evidence of this belief occurs in the works of Paracelsus. He maintained that "the human body was endowed with a double magnetism, that one portion attracted to itself the planets, and was nourished by them, whence came wisdom, thought and the senses; that the other portion attracted to itself the elements and disintegrated them, whence came flesh and blood; that the attractive and hidden virtue of man resembles that of amber and the magnet; that by this virtue, the magnetic virtue of healthy persons attracts the enfeebled magnetism of those who are sick." The latter part of this doctrine is believed by many people at the present

time; witness the widespread belief that an enfeebled person should not occupy the same bed with a strong, lusty individual, lest the enfeebled vitality of the one should be overcome and absorbed by the stronger vitality of the other. Many scientists of the sixteenth and seventeenth centuries, notably Glocenius, Fludd, Kircher, Burgrave, and Maxwell accepted the doctrines of Paracelsus, and declared that all natural phenomena could be explained through magnetism. These learned gentlemen thought that by magnetizing talismans and hanging them about the persons of the sick, that the vital spirit could be infused thence into the bodies of invalids, thus effecting cures.

Anthony Mesmer, who was born in Germany in 1734, discarded the talismans and magical boxes of his predecessors and applied this, so-called, universal principle directly to the bodies of the sick through the agency of passes and contact. In the beginning of his career, however, Mesmer used the magnetic steel tractors of the Jesuit, Father Hell. He soon abandoned them and confined himself to manual manipulations and passes, asserting that animal magnetism was entirely distinct from the influence exerted by the magnet.

In 1779 Mesmer left Vienna and came to Paris, where he at once began to give lectures on his theory of the magnetic fluid. In these lectures he declared that "he had discovered a principle capable of curing all diseases." Says Binet and Feré: "He summed up his theory in twenty-seven propositions, or rather assertions, most of which only reproduce the cloudy conceptions of magnetic medicine." These propositions while they are full of the mysticisms, the errors, and the superstitutions naturally belonging to the period at which they were formulated, yet contain the germs of scientific truths. As I wish to establish, later on in this paper, the fact that certain individuals are more susceptible to hypnotic influence than are others, I will here introduce evidence obtained from the writings of one who witnessed Mesmer's *seances.* Says Bailly: . . . "They are so submissive to the magnetizer that even when they appear to be in a stupor, his voice, a glance, or sign will rouse them from it. It is impossible not to admit,

from all these results, that some great force acts upon and masters the patients, and that this force appears to reside in the magnetizer. It has been observed that *many women* and *few men* are subject to such crises." These crises were characterized by "*convulsions, cries, shouts, and groans.*" The same writer says elsewhere: "It has been likewise observed that they (crises) are only established after the lapse of two or three hours, and that when one is established others soon and *successively* begin." (Certain words and expressions are here and elsewhere italicized for future reference). Mesmer's treatment became exceedingly popular. He, consequently, incurred the jealousy and hatred of the Academy of Science and the Academy of Medicine, these academies emphatically declaring that there was nothing in his method and that his theory was arrant nonsense. Where upon Mesmer left France, notwithstanding the fact that the government offered him a life-pension of 20,000 francs on the sole condition of his remaining and continuing his method of practice. He returned, however, at the solicitation of his admirers who offered him a purse of 10,000 louis for a series of lectures on magnetism. These lectures were published and set the kingdom into a ferment, many declaring that Mesmer was a charlatan and a fraud, while as many more declared that he was a great discoverer and a benefactor of the human race. In 1784 the government ordered an investigation and appointed a commission to inquire into magnetism. Their report is exceeding interesting, in as much as it shows how very near, indeed, these men of wisdom were, in grasping the salient features of hypnotism. Benjamin Franklin was a member of this commission, his name being signed first of all. A translation of report reads as follows: "The commissioners have ascertained that the animal magnetic fluid is not perceptible by any of the senses; that it has no action, either on themselves or the patients subjected to it. They are convinced that pressure and contact effect changes which are rarely favorable to the animal system, and which injuriously affect the imagination. Finally, they have demonstrated, by decisive experiments, that imagination apart from magnetism produces convulsions, and that

magnetism without imagination produces nothing. They have come to the unanimous conclusion with respect to the existence and utility of magnetism, that there is nothing to prove the existence of the animal magnetic fluid; that this fluid, since it is non-extistent, has no beneficial effect; that the *violent effects* observed in patients under public treatment are due to contact, to the excitement of the imagination, and to *mechanical imitation* which involuntarily impels us to repeat that which strikes our senses. At the same time, they are compelled add, since it is an important observation, that the contact and repeated excitement of the imagination which produce the crises may become hurtful; that the spectacle of these crises is likewise dangerous, *on account of the imitation faculty* which is a law of Nature; and consequently that all treatment in public in which magnetism is employed must in the end be productive of evil results.

(Signed) B. Franklin, Majault.
Bailly, LeRoy, D'Arcet.
DeBory, Guillotin.
Lavoisier.

Shortly after this report was presented, the Royal Society of Medicine filed their report in which they came to the same conclusions, one member, however, Laurent de Jussieu, dissenting. De Jussieu filed a separate report in which he foreshadowed several points now universally acknowledged to be established truths. He declared that the experiments demonstrated the fact that man was capable of producing a sensible impression on his fellows through the agency of friction or, contact. Charcot has shown that "the efficacy of contact and friction is proved by the existence in certain subjects of hypnogenic zones, of which the slightest stimulation produces somnambulism; that the irritation of hysteriogenic zones produces convulsions, and that these zones are generally seated in the hypochondriac, or in the ovarian regions, on which Mesmer preferred to exercise his manipulations." M. de Puységur of Buzancy, near Soissons gave, in 1784, the first account of hypnotism produced by manipulation, and the sequent phenomena of healing by suggestion. He discovered

PLATE XXIX.

1. *Paradisea apoda.* 2. *Parotia sefilata.* 3. *Cicinnurus regius.* From Brehm's Thierleben.

that a patient, whom he was treating for inflammation of the lungs, was thrown into a condition resembling sleep, yet, who retained conciousness, spoke aloud, and attended to his every day affairs. De Puységur discovered that, by suggestion, he could change the current of this patient's thoughts and make him do his bidding, at one moment, weeping as if it in great sorrow, the next, laughing as if convulsed with joy. "In his *waking state* he was *simple* and *foolish*, but during the *crisis* his intelligence was *remarkable*." From 1784 to 1882 the science of hypnotism and the treatment by suggestion was undergoing a slow evolution which finally culminated in the work of M. Charcot, who at last took this beneficial therapeutic agent from the hands of charlatans and quacks, and placed it where it belongs—among the remedial agents of reputable, scientific physicians. I have shown in this brief *resumé* of the history of hypnotism that certain classes of individuals were more susceptible to this influence than others, and that gender was a great and favorable factor. The words previously italicized show that women more frequently than men were influenced by hypnotic suggestion, and that these favorable subjects always gave evidences of hysteria or kindred neurotic lesions. The observations of Charcot and his pupils substantiate the experiences of the older scientists in this respect, and my own experience tallies with that of Charcot. I, therefore, deem it safe to advance the proposition, that the individuals who yield to the influence of hypnotism are always those who are neuropathic; Prof. Charcot wrote me, a short while before his death, that "he had come to the conclusion that all hypnotic subjects were the victims of neurotic lesion in some form or other." When we come to study the psychological phenomena accompanying hypnotism, we at once discover that this is a perfectly natural and absolutely truthful conclusion.

Man possesses two kinds of conciousness—an active, vigilant, co-ordinating conciousness, and a passive, pseudo-dormant, and, to a certain extent, incoherent and non-co-ordinating conciousness. We can readily prove the truth of this by observing certain phenomena which are to be noticed daily among ourselves. A man falls into a "brown study," and, if

gently approached without being startled, he may be asked questions which he will answer intelligently without any concious act on his part. His subconciousness, for the time being, holds him beneath its sway. Yet his active conciousness is not so much obtunded but that he can answer questions intelligently. Again, if a musician seated at a piano and improvising, be approached and gently questioned, he will answer the questions intelligently without ever ceasing his improvisation. His subconciousness is elaborating the sweetest harmonies, yet his active conciousness is not so far away but that it can give utterance to co-ordinating thought action.

Again, when the active conciousness is stilled in slumber, subconciousness sometimes remains awake and makes itself evident in dreams. The lack of rational thought—co-ordination in subconciousness is shown by the more or less extravagance and incoherence of dreams. Everything, no matter how unnatural and extravagant, occurring to the dreamer, is accepted by him as being natural and consistent. When, however, his active conciousness is aroused, he at once recognizes the incocoherence of his dreams. I hold, emphatically, that all dreams, when closely studied, will show extravagance and incoherence. A dream may seem, at first glance, to be entirely coherent, but, if the remembrance of the dream be perfect and it be closely studied, numerous incoherences will always be discovered.

We know how easy it is for us to lose ourselves in abstraction. We will sit for several moments seemingly in profound thought, yet when suddenly aroused and asked what engaged our thoughts, we are unable to tell. We have been in a subconcious state, probably revelling in the wildest vagaries. Fortunately for us, degeneration has left no weakened spot in our active conciousness on which to engraft the erotic imaginings of our non-coordinating subconciousness, consequently our moments of subconciousness are blanks. The favorable hypnotic subject is easily thrown into the subconcious state. The sudden entrance of a bright light into a darkened room; a loud noise; a sudden stillness after prolonged noise; the crackling of a lighted match; a breath of cold or warm air is all that necessary, sometimes, to bring about hypnosis. I

regard hypnosis as a state analogous to that of the "brown study" in which active conciousness is obtunded or asleep. It is, however, an intensified and aggravated form of mental abstraction, in which active conciousness is, more or less, profoundly affected. Why is it, that in the case of the favorable subject of hypnotism, the active conciousness can be so easily overcome? Simple because it is weakened by neurotic degeneration. That portion of the psychic system in which dwells active conciousness is always the first to degenerate and lose its tonicity. This is shown by the thousands of erotic mental habitudes and perversions that are to be noticed in neuropathic and psychopathic individuals. Active conciousness—the balance-wheel of the psychic system, becomes disordered and at once a flood of erotic fancies make themselves evident. It stands to reason that, in an individual, who shows by his actions and his thoughts that he is the victim of nervous degeneration, his active conciousness would be easily obtunded and put to sleep. This is, emphatically, the case, a fact that is clearly demonstrated by the favorable hynotic subject, who is always neuropathic. We know that subconciousness is capable of receiving an impression and of acting entirely independent of active conciousness—witness the phenomena of somnambulism.

When this fact is admitted the phenomena of hypnotic suggestion are readily accounted for and understood. We have seen that many subjects fall into the hypnotic state when excited by the most trivial extraneous influences such as the scratching of a match; a sudden noise; or a sudden stillness coming after long and continuous noise. Again, hypnosis can be produced by the favorable subject, sometimes, without the aid of extraneous influences. A patient of mine, an hysterical woman, would seat herself in a chair, "look cross-eyed," and, in a very few moments, become hypnotized. On one occasion, in order to test her condition, I commanded her to repeat the following lines, in lieu of the usual blessing, the next morning at breakfast: "*Juro tibi sanctæ per mystica sacra Dianæ me tibi venturam comitem sponsamque futuram.*" I wrote these lines on a slip of paper and gave it to her husband, a good Latin scholar, who declared that she repeated them word for word,

giving the correct pronounciation, adding, however, the word "amen." This lady had never studied Latin and was not familiar with the quotation. Another patient, a young girl, who was psychopathic and neurothenic, could hypnotize herself by gazing at the brass ring of a window curtain. Both she and I discovered this fact accidently, I, having discovered her, on one occasion, in a hypnotized state, intently gazing at the brass ring just mentioned. By a systematic course of fasting and mental abstraction, thus weaking active conciousness, the *tchogis* and *fakeers* of India are enabled to throw themselves into a hypnotic condition at will. I have seen so-called spirit-mediums and clairvoyantes who could bring about hypnosis a dozen times daily if necessary. Surely no one will assert that these subjects are influenced by magnetism emanating from themselves or from outside objects. One might just as well accept the doctrines of Paracelsus and his disciples of the sixteenth and seventeenth centuries. We have seen that the usual avenues to the hypnotic state lie through the senses of sight and hearing, yet the sense of touch affords another avenue. On the bodies of favorable subjects there are certain areas called hypnogenic zones. When these zones are rubbed or tickled the subject immediately passes into the hypnotic state. In conclusion let me state, that I am confident that hypnosis can be produced in the favorable subject, through many different avenues or agencies, and that every one of these agencies will be absolutely devoid of magnetism or any occult force.

RULES OF NOMENCLATURE ADOPTED BY THE INTERNATIONAL ZOOLOGICAL CONGRESS, HELD IN MOSCOW, RUSSIA, 1892.

PART II.

TRANSLATED BY MORITZ FISCHER.[1]

I. NOMENCLATURE OF HYBRIDS.

1. (*a*) In the naming of hybrids the name of the male should preceed that of the female, and be united with the latter by the sign of multiplication. The use of the astronomical signs to indicate sex can be dispensed with. Of the two examples following, either can be used, as *Capra hircus* ♂ × *Ovis aries* ♀, or *Capra hircus* × *Ovis aries.*

(*b*) Another method can be employed for this purpose. The two names can be represented as is a fraction, the name of the male forming the numerator, and that of the female the denominator, as $\frac{\text{Capra hircus}}{\text{Ovis aries.}}$. This second method possesses the advantage that the name of the observer can be indicated whenever such indication is desirable, as $\frac{\text{Bernicla canadensis}}{\text{Anser cygnoides}}$ Rabé.

(*c*) The second method should be employed where either one of the parents is a hybrid, as $\frac{\text{Tetrao tetrix} + \text{Tetrao urogallus}}{\text{Gallus gallinaceus}}$.

(*d*) In case the parents of a hybrid are unknown, it provisionally takes a simple specific name like a true species, but the generic name is preceded by the multiplication sign, as × *Salix erdingeri* Kerner.

II. GENERIC NAMES.

2. Every foreign word employed, either as a generic or specific name, should retain the meaning it has in the language from which it is taken, if in this language it denotes an organized being, as *Batrachus bdetta.*

III. SPECIFIC NAMES.

3. The geographical names of uncivilized countries, and of such peoples as do not use the Latin alphabet, should be tran-

[1] The first part of these rules was published in the AMERICAN NATURALIST for May, 1892.

From the *Revue Scientifique*, No. 15, tome 50.

scribed according to the rules adopted by the *Geographical Society of Paris.*

4. Both the preceeding article and article 21 of the rules adopted by the Zoological Congress of Paris, in 1889, are applicable to names of persons, as *Boydanovi, Metcknikovi.*

5. The virginal spelling and all diacritic signs must be preserved in the Roumanian and certain other Slavonic languages (Polish, Croatien, Bohemian), and likewise in those which use the Latin alphabet, as *Tænia Medići, Congeria Čžjžžki.*

6. Specific names may be formed from feminine patronymics or from common nouns. In such cases the genitive takes the ending *oe* or *orum* to the full name of the person to whom one dedicates, as *Merianoe, Pfeifferoe.*

IV. Spelling of Generic and Specific Names.

7. (*a*) Patronymics or surnames used for specific names must always be spelled with a capital letter, as *Rhizostoma Cuvieri, Francolinus Lucani, Laophonte Mohammed.*

(*b*) A capital letter can be used with certain geographical names, as *Antillarum, Galliae.*

(*c*) In all other cases, the specific name is spelled with a small letter, as *Oestrus bovis, Corvus corax, Inula helenium.*

8. If the name of the subgenus is cited, it should be placed in parenthesis between the generic and specific names, as *Hirudo* (*Haemopis*) *sanguisuga.*

9. If the name of a subspecies or variety is cited, it follows the specific name without any inter-punctuation. The name of the author of this subspecies or variety can be cited likewise without inter-punctuation, as *Rana esculenta marmorata* Hallowell.

10. If a species has been placed in a genus other than the one to which it was assigned by its author, the name of this author is retained in notation, but placed in parenthesis, as *Pontobdella muricata* (Linné).

V. Subdivision and Consolidation of Genera and Species.

11. If a species is subdivided, the limited species to which is applied the name of the original species receives a notation

indicating both the name of the author who established the same and the name of the author who subdivided the species as *Taenia pectinata* Goeze partim Riehm.

According to article 8, the name of the first author is put in parenthesis if the species has been placed in a different genus, as *Moinezia pectinata* (Goetze partim) Riehm.

VI. Family Names.

12. A family name must be discarded and replaced by another if the generic name from which it was formed is a synonym, and is itself discarded.

VII. Law of Priority.

13. Zoological nomenclature dates from the issue of the sixth edition of *Systema naturae*, published in 1758. This is the standard work to which that zoologist must refer who wishes to investigate and employ the oldest generic and specific names, provided they conform to the fundamental rules of nomenclature.

14. The law of priority is applicable to family names or to those of higher groups, as well as to the names of genera and species, provided groups are concerned which have a similar extension.

15. A species which has been wrongly identified, must take its correct name, according to article 35 of the rules adopted by the Zoological Congress of 1889.

16. The law of priority must obtain, and consequently the oldest name must be retained.

(*a*) When some part of a creature has been named before the creature itself was known, as in the case of fossils.

(*b*) When the larva, supposed to be an adult form, has been named before the adult form was known.

Exception should be made for the Cestodes, the Trematodes, the Nematodes, the Acanthocephales, the Acariens and, in fine, for all animals passing through metamorphic and migratory stages. Many of these species are now being revised, and their nomenclature will possibly undergo a complete change.

(*c*) When the two sexes of the same species have been considered as distinct species or as belonging to different genera.

(*d*) When the animal presents a regular succession of unlike generations, which have been considered as belonging to divers species or even genera.

17. It is very desirable that each new description of a genus or species be accompanied by a diagnosis in Latin, or, at least, a diagnosis in one of the four best known European languages, i. e., French, English, German, Italian.

18. In works not published in one of the above-mentioned languages, the explanation of the plates should be translated entire, either into Latin or one of the continental languages.

19. When several names have been proposed simultaneously, and priority for any one cannot be established, there should be adopted—

(*a*) That name which is applied to a well-characterized and typical species, in case of a generic name.

(*b*) That name which is accompanied by either figure, diagnosis or description of an adult form, in case of a specific name.

20. Generic names already employed in the same kingdom cannot be used.

21. The use of those names should be avoided which can only be distinguished by their gender endings or by a simple orthographic change.

22. Specific names already employed in the name genus cannot be used.

23. The generic and specific names which become non-available through the application of the foregoing rules cannot be employed anew, even if they express a new meaning in the same kingdom, if the name is generic; in the same genus if the name is specific.

24. A generic or specific name once published cannot be withdrawn, even by its author, on account of ambiguity.

25. All barbarisms and solecisms must be corrected; hybrid names, however, such as *Geovula*, *Vermipsylla* should be retained.

VIII. Allied Questions.

26. The metric system is the only one employed in zoology. Foot and span, pound and ounce should be banished forever from scientific language.

27. Heights and depths, speed and all other common measures are expressed in metres. Fathoms, knots, nautical miles and like terms should disappear from scientific language.

28. The one-thousandth part of a millemeter (0mm, 001), represented by the Greek letter μ, is the unit of measure adopted in micrography.

29. Temperatures are expressed in degrees of the centigrade thermometer of Celsius.

30. The indication of the enlargement or the reduction of an illustration is indispensable to its correct understanding. This indication is expressed in numbers and not by noting the number of the objective which was employed in producing the illustration.

31. It is proper to indicate whether a linear or a surface enlargement has been employed. These notations can easily be abridged, as : $\times$ 50 $\square$, indicating a surface enlargement of fifty times; $\times$ 50 — indicating a linear enlargement of fifty times.

PRAIRIE CHICKEN AND WILD PIGEON IN JACKSON COUNTY, MICHIGAN, 1894.

By L. Whitney Watkins.

It has been nearly twenty years since the last prairie chicken, *Tympanuchus americanus*, was seen in this or neighboring localities. Occasionally reports have come to me of their presence still, in the vicinity of Freedom Swamps Washtenaw County, and Portage and Wolf Lakes Jackson County. Careful investigation, however, has found these reports founded, usually, upon the exaggeration of some hunter, possessed of an enthusiastic turn of mind, and entirely lacking in substantial evidence.

In 1893 we have the following notes on this species from neighboring counties: "Extinct at Ann Arbor, Washtenaw County," Dr. J. B. Steere. "Extinct for more than thirty years in Monroe County," Jerome Trombley. Authorities have generally regarded them as a game bird figuring only in the romantic past of this part of Michigan.

On April 22, 1894, Charles V. Hay, a clever sportsman of a town near at hand, brought me the welcome news that on the day previous he had actually flushed sixteen "chickens" in Merrill's cranberry marsh of about thirty acres extent and not a mile from the village of Norvell. As Mr. Hay has hunted these birds on the western plains there could be little doubt of the identity, and sure enough they were easily found, in all their old-time glory, a few days later. Local hunters were much excited as the news spread, and old followers of the "sport with rod and gun" shook their gray heads in silent amazement. They would as soon have expected to again witness the running ascent of the wild turkey among the broad-topped trees of the "Oak Openings," as the plunging rise of the prairie hen from the adjoining meadow. These birds are now nesting and once again the loud "booming" of the cocks

has resounded back and forth among the hills which have not known the old familiar sound for many a year before.

Adolphe B. Covert, the veteran ornithologist and taxidermist of Washtenaw County, tells me that a small band of prairie chickens has continued to live in a tract of marsh land some distance from Ann Arbor, notwithstanding Dr. Steere's notes to the contrary. Thus it is very probable that our immigrants, unless they switched off from some western contigent of Coxey's Army, came from some such isolated locality where yet a few pairs nest, rather than in a long flight from the southwest as many would believe.

On June 13, 1894, late in the afternoon, as I was returning from an interesting day among the late-nesting water birds, a fine male wild pigeon, *Ectopistes migratorius*, was startled from a plowed field, lately sown to buckwheat, and rose in full view not more than thirty feet away, affording identification of which I am positive. He flew a few rods and dropped gracefully into the dense foliage of a maple tree by the roadside. Then as I approached, wondering at the presence of the beautiful bird, now so rare, whose garnished plumage turned the rays of the sun into a thousand bright reflections, and in a land over which, in numbers eclipsing all other species, his ancestry once fairly swarmed, he again took wing and with a rapid, measured tread of his pointed pinions disappeared in an instant over the wooded hills beyond. But the old-time flights of pigeons are forever of the past. It had been nine years since the last few were seen here, and we had begun to think it very probable that they would never again be noted.

On June 16, a pair were seen in the same field and on June 18 three were noted by my brother, two of which he was very certain were young of the year. Perhaps a pair of "$2.00 eggs" were hatched in this very locality.

Of the disappearance of the wild pigeon in Southern Michigan, we have the following notes: "Extinct at Ann Arbor in 1875," Dr. J. B. Steere. "Extinct in Monroe County in 1885," Jerome Trombley. "Last seen at Morrice, Mich., in 1881," Dr. W. C. Brownell.

We thus see that birds long supposed to be of the past may yet linger with us in a few lonely specimens. Oh! that we might reinstate again the proud hosts of the mystic past in the lands they once adorned, and in whose ornithological features they once figured so prominently. To this land a few still cling in loving faithfulness to the traits of an innumerable ancestry.

EDITORIALS.

We have frequently complained in these columns of the exclusive conduct of scientific enterprises by persons not acquainted with the sciences and not engaged in their pursuit. We will not enumerate the blunders committed by such persons under such circumstances, as they have recently come under our observation; but only refer now to a question of taste in which some of these well meaning persons have immortalized themselves in stone. A new building for the use of the collections of the Academy of Natural Sciences of Philadelphia was recently erected, chiefly from money appropriated by the Legislature of Pennsylvania. An entrance doorway was devised, and in order that it should represent the uses of the building, it was adorned with figures and reliefs of animals. Persons possessed of the least spark of originality would have seen the propriety of representing in these figures something appropriate to the country, and if possible the institution. Nothing would have been easier than to have placed at the entrance of the Museum, figures of some of the forms of life discovered by its members. The idea was suggested to the gentlemen in charge of the construction, but to commemorate in so conspicuous a manner the services of the naturalists of the Academy it did not strike them favorably. So it came that the apex of the entrance was surmounted by, not even an African lion, but an official British lion, with his mane brushed into a collar like Punch's dog, such as one sees on Government buildings in Great Britain. On each side is a lioness similar to those seen on buildings all over the world. At the summit of one lateral column is a head of a hound, and on the other side a ram with very unsymmetrical horns, both foreign importations. Of the animals in relief above the door, the only American animal is a crab, *Lupa diacantha*, which is indeed, very appropriate to the building commission, as it generally goes backwards, and pinches its nearest neighbors.

—When the natural sciences are taught in our public schools, there will be fewer absurd and untrue stories published in the newspapers. Thus a recent Philadelphia paper tells of a man in Arizona who had two Helodermas ("Gila monsters"), each three feet in length, which acted as watch-dogs for him, and which killed a would-be assassin who entered his house at night. From New York comes a story of a physi-

cian who fed his guests with cholera bacilli, and thus caused their deaths. This doctor is said to reside in Buenos Ayres, and his name is given. A New York paper publishes a reporter's interview with the Governor of Illinois, in which that worthy is made to say that he is afflicted with locomotor ataxia. According to the Governor, the interview never took place. Here inaccuracy has passed into mendacity, as in the case of the *New York World's* interview with the astronomer Secci, which were shown to have been pure inventions. One of the editors of this journal thought he would investigate the source of stories as to the frequent appearance of an alleged ghost on a moor south of Brooklyn last August. These stories had been published in a conspicuous way in several papers of New York and Brooklyn for several weeks, and it seemed worth while to look into a matter which they published as serious news. Nothing was seen, however, but a few young men, among whom were reporters of the *Brooklyn Eagle*, the *New York Sun*, and the *New York World*. The last-named confessed to having himself filled the rôle of ghost on one night by using newspapers, so that this ghost, like most others, appears to have been of a purely subjective origin on the part of one newspaper at least.

—Lieutenant Peary's party has returned, leaving him to prosecute his researches with only two companions. The results to geography are not great, as he was compelled to abandon the expedition to the northeast coast of Greenland, owing to extreme severity of the weather. Some of the men who have returned, have been talking in a way which shows that they are not adapted for service on an exploring expedition, and Lieutenant Peary is, apparently, well rid of them. It is hoped that the next season will be more propitious. We express here our regret that the Academy of Natural Sciences of this city has not contiuued to interest itself officially in this important enterprise, as it did in the beginning.

—An artificial taste or custom has often interfered with healthy natural processes in human affairs. The follies of human fashions are innumerable. We refer now to one of minor importance, and yet one which well illustrates the proposition—that is, the alleged fattening of oysters for the market: The nearer the habitat of an oyster approaches salt water, the better will its flavor be, as, for example, the Blue Points of Long Island Sound, the Chincoteagues of the Maryland Coast, the Norfolks of Virginia and the Barataria of Louisiana. These oysters all have, in the natural state, a brownish or yellowish tint, which, to the connoisseur, is a sure indication of their superior merits. Here,

however, the perversity of an artificial taste enters. Many people must have them white. Such persons prefer a comparatively fresh water oyster, as the Maurice River Coves of the Delaware and those of the upper Chesapeake. Also, if they are not fat they must be made so. To accomplish these two most undesirable ends, the oysters are supplied with fresh water so gradually as not to kill them immediately. They lose the russet tint of health if they have it, and become swelled up by endosmosis. Their flavor is destroyed and is replaced by one that strongly reminds one of that of the leucomaines produced in the stomach by indigestion. The oysters are thoroughly sickened, and in this state are sold and eaten in large numbers by multitudes who do not know the flavor of that most excellent mollusc, a healthy salt water *Ostrea virginica*.

—This year was very wet during the spring in the Eastern States, and this period was followed by one of the severest draughts known in our history, which is now, fortunately, broken. The heat of the summer was nearly or quite equal to that of 1876. Whether these peculiar conditions be the cause or not, the scarcity in the same region of batrachians, reptiles and birds during the past season has been exceptional.

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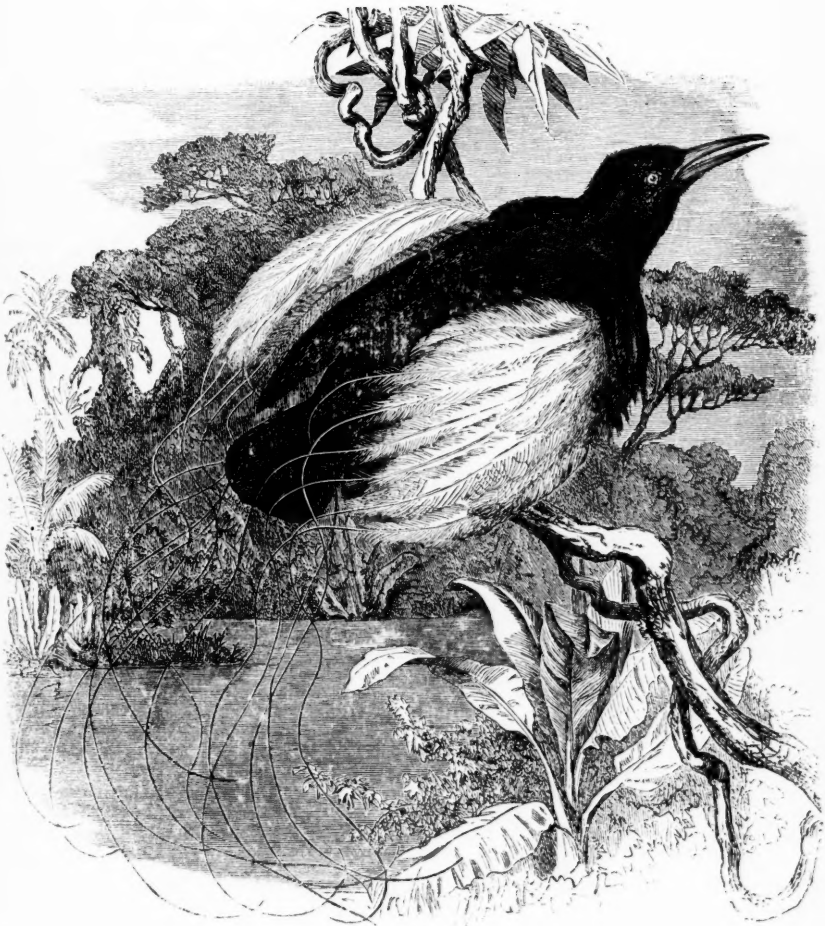

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WILLISTON, S. W.—A New Dicotyline Mammal from the Kansas Pliocene. Extr. Science, Vol. XXIII, 1894.

WINSLOW, A.—The Art and Development of Topographic Mapping. Extr. Engineering Mag., 1893. From the author.

WRIGHT, G. F.—Continuity of the Glacial Period. Extr. Am. Jour. Sci., Vol. XLVII, 1894. From the author.

RECENT LITERATURE.

Amphioxus and the Ancestry of the Vertebrates.[1]—This important monograph will be welcomed by all students of zoology as as a valuable accession to the literature of the theory of descent. More than this, the volume bears internal evidence throughout of painstaking care in bringing together, in an exceedingly readable form, all the essential details of the structure and metamorphosis of amphioxus as worked out by anatomists and embryologists since the time of Pallas, its discoverer. The interesting history of the changes it undergoes during metamorphosis, especially its singular asymmetry, is clearly described and ingenious explanations of the phenomena are suggested.

Most important, perhaps, are the carefully suggested homologies of the organs of *Amphioxus* with those of the embryos of the vertebrates above it in rank, especially those of the Marsipobranchs and Selachians. Though the comparisons with the organisms next below amphioxus, such as the Ascidians, *Balanoglosus*, *Cephalodiscus*, *Rhabdopleura* and the Echinoderms, will be found no less interesting. In short, the book may be commended to students already somewhat familiar with zoological facts and principles, as an important one to read. They may thus be brought to appreciate to what an extent the theory of descent is indebted to the patient labors of the zoologists of the last forty years for a secure foundation in observed facts, seen in their proper correlations, according to the comparative method.

The figures are good and there is very little that can be adversely criticised in the book. On page 176 it is stated that the ectoderm is not ciliated in any craniate vertebrate. To this statement exception must be taken in regard to the ectoderm of the sides of the body and especially the tail of young tadpoles just hatched. Born in his experiments, in grafting pieces of young tadpoles upon one another, found that the tail, when cut off and lying on its side, had a power of movement, in the cephalad direction, that could be explained only on the supposition that the ectoderm of the sides was more or less extensively covered with cilia. This observation the writer has confirmed in repeating Born's experiments in just hatched tadpoles of *Rana*. The

[1] Volume II of the Columbia University Biological Series, by Arthur Willey, B. Sc. 8vo, pp. 316, 135 figures. New York, MacMillan & Co., 1894.

volume, however, brings together everything essential that has ever been made out in regard to *Amphioxus*, so that zoologists will everywhere feel grateful to Mr. Willey for placing in their hands this very useful summary of its life history. The work contains not a little that is new, and some new figures not hitherto published. A very complete bibliography and index completes the volume. One hundred and thirty-three titles are comprised in the list of papers and works consulted in the preparation of the volume. If the other volumes in course of preparation by the professors in biology of Columbia University are up to the high standard of the present one, that institution is to be congratulated upon the enterprise of those who have initiated the project.—R.

Correlation Papers of the U. S. Geol. Survey: Archean and Algonkian.[2]—This memoir, written by Prof. C. R. Van Hise, is the seventh of the Correlation Papers series, and is, perhaps, one of the most important of that valuable set. The pre-Cambrian rocks of the United States and Canada, for convenience, are considered under the heads of seven districts, which are severally discussed in as many chapters. Each chapter is prefaced with abstracts of all the articles pertaining to the subject considered, classified by dates, together with summaries of the conclusions which appear to be established. Chapter VIII summarizes the various successions proposed, suggests one, and discusses the principles of pre-Cambrian stratigraphy. The Archean is the basal complex of America. It has everywhere, if large areas are considered, an essential likeness. It consists mainly of granitic, gneissic and schistic rocks, among which are never found beds of indubitable clastics. When different kinds of rocks are associated, their structural relations are intricate, which, together with the crystalline schistose character of the rocks, the broken and distorted mineral constituents, and involuted foldings are evidences that these rocks have passed through repeated powerful dynamic movements.

In regard to Algonkian stratigraphy, the writer accepts the structural and lithological principles enunciated by Irving, Pumpelly and Dale. It remains to be demonstrated, however, to the satisfaction of most geologists that the formation termed Algonkian, is not a part of the Cambrian.

[2] Bulletin of the Geological Survey, No. 86. Correlation Papers. Archean and Algonkian. By Charles R. Van Hise. Washington, 1892.

Economic Geology of the United States.[3]—In a volume of 509 pages, Mr. R. S. Tarr has compiled the information, up to 1893, concerning the mineral resources and industries of the United States. Although intended as a text-book to supplement a course of lectures at Cornell University, the style of the writer makes it of general interest. Part I treats of the common rock and vein-forming minerals and ores, the rocks of the earth's crust, physical geography and geology of the United States, origin of ore deposits, and mining terms and methods. Part II takes up metalliferous deposits in detail. The statistics are almost all compiled from the standard sources. An appendix contains the literature of the subject and a list of authors and works referred to in the text. A number of cuts illustrate the text.

Woods' Invertebrate Paleontology.[4]—This crown octavo of 222 pages, by Professor Henry Woods, is the first of the Cambridge Natural Science Manuals. In it the author presents a condensed account of the invertebrate paleontology necessary for a geological student, limiting himself for space reasons to a consideration of those fossil animals that are most useful to a stratigraphist. Each group is discussed according to the following general plan: first, its general geological features; secondly, the classification, characters and time range of the geologically important genera; thirdly, the distribution of each group. The text is abundantly illustrated and well indexed.

[3] Economic Geology of the United States with briefer mention of Foreign Mineral Products. By R. S. Tarr. New York, 1894. MacMillan & Co., Publishers.

[4] Elementary Paleontology for Geological Students. By Henry Woods, B. A., F. G. S. Cambridge, 1893.

General Notes.

PETROGRAPHY.[1]

Zirkel's Petrographie.—The second volume of Zirkel's treatise on Petrography[2] has recently appeared in America. It treats with such fulness of the massive rocks that an epitome of its contents is out of the question in this place. The volume discusses the composition, mineral and chemical, the structure and the distribution of the various types of the eruptive rocks with a thoroughness found only in German text-books. The descriptions of their important occurrences will be especially valuable to the student who has not a library at his disposal; and to the investigator, the large and accurate lists of references scattered through the book are very welcome. Many petrographers will differ with the author as to the importance and desirability of some of his types, and others will find fault with him concerning some of his theories, as, for instance, that of the origin of olivine aggregates in basalts. The volume is, however, on the whole quite free from theoretical discussions. While it loses something of its interest in consequence of this lack of theory, the book gains the confidence of the reader, who desires more particularly an account of the work done in the different provinces, where the rocks in which he is interested are to be found.

Inclusions in Volcanic Rocks.—Two articles on the petrographical changes affected by the partial or entire solution of foreign inclusions in volcanic rocks have recently appeared. The first is an essay by Dannenberg,[3] and the second a volume of 710 pages by Lacroix.[4] Dannenberg's article treats more particularly of the inclusions in the Siebengebirge basalts, andesites and trachytes. Zircons, corundum, magnetite, pyrite, feldspar, sillimanite, quartz, sandstone, schists and granite were found included in both basic and acid rocks of the region. Those inclusions that were most similar to the including rocks suffered much less alteration than those that differed most in chemical composition from the lavas. The aluminous compounds frequently yielded

[1]Edited by Dr. W. S. Bayley, Colby University, Waterville, Me.

[2]F. Zirkel: Lehrbuch der Petrographie, Leipzig, 1894, pp. iv and 941.

[3]Min. u. Petrog. Mitth. XIV, p. 17.

[4]Les Enclaves des Roches Volcaniques, Macon, 1893, pp. 710, pl. vii, fig. 84.

spinels as a consequence of the contact action. In many instances different combinations of inclusion and including rocks gave rise to the same new products, so that it is difficult to discover the exact law governing the changes. In the basalts the principal inclusions consisted of single minerals, while in the more acid rocks they comprised largely rock fragments—a fact probably attributable to the different solvent powers of the including material. Lacroix's volume is a nearly complete treatise on the subject of which it treats, which is limited, as the title indicates, to the study of inclusions in volcanic (effusive) rocks only. The author separates inclusions into two classes. The first comprises fragments of an entirely different nature from that of the enclosing rock, as granite in basalt. These he calls enallogenous (enclaves énallogènes). The second class comprehends inclusions more or less similar in composition to the including material. These he terms homogeneous inclusions (enclaves homoeogèues). The second class embraces aggregates formed by segregation and by liquation, as well as true inclusions. The including rocks are also separated into two groups, the basaltic and the trachytic. In the first part of the book the enallogenous inclusions are discussed with great thoroughness. In the second part the homogenous inclusions are studied. In a third part are collected the general conclusions. Chapters are devoted to each class of rocks and divisions of the chapters to the character of the inclusions in them. Resumés and paragraphs embracing the results of the studies are scattered through the volume at convenient intervals, and a geographical index concludes the book. The number of discoveries made by the author in the course of his work is too large for discussion in this place. The book bears evidence of thoroughness throughout. It is an excellent contribution to the subject of contact action.

The Basic Rocks of the Adirondacks and of the Lake Champlain Region.—Kemp[5] gives a brief account of the coarse basic rocks of the Adirondacks of which the well known norite is a phase Associated with the norite are anorthosites, gabbros and olivine gabbros, all of which are more or less schistose. The anorthosites are crushed, and where the shattering has been most intense their plagioclase has been changed to a fine grained aggregate, thought to be saussurite. Augite and brown hornblende are present in these rocks, but not in large quantity. Garnets are always present. The more basic gabbros are dark rocks, whose plagioclase has a greenish tinge due to the abund-

[5]Bull. Geol. Soc. Amer. 5, p. 213.

ance of dust inclusions scattered through it. The special features of the gabbros are the reaction rims around pyroxene and magnetite. A zone of small brown hornblendes is often found between the first named mineral and plagioclase. Between magnetite and feldspar are usually three zones, of brown hornblende, pink garnet, and quartz, respectively, the last named mineral occurring nearest the feldspar. Sometimes the order of the zones is different. The quartz may appear within the zone of garnets, in which case the latter mineral may replace the feldspar in part, as alternate lamellae between lamellae of plagioclase. The gabbros contain large bodies of titaniferous magnetite. On the contact of the eruptive with limestone the latter rock has been crystallized and silicified. The same author, associated with Marsters,[6] has described the trap dykes of the Lake Champlain region as camptonites, fourchites, monchiquites and bostonites.

The Augite Granite of Kekaquabic Lake, Minnesota.— The granite of Kekaquabic Lake in Northeastern Minnesota, occurs in granitic and in porphyritic phases, according to Grant.[7] In both varieties the constituents are quartz, anorthoclase and other feldspars, augite, a little hornblende, biotite, apatite and sphene. The granitic variety needs no further mention. In the porphyritic phase the quartz and feldspar form a fine grained groundmass in which lie phenocrysts of feldspar and augite. An analysis of this feldspar, whose density is 2.58–2.62 gave:

SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	K_2O	Na_2O	H_2O	Total
67.99	19.27	.82	.75	.02	3.05	6.23	.90	= 99.03

The augite comprises from 5–20 per cent of the rock. Its tint varies from green to colorless, the lighter colored portion often lying within a darker outer zone. Analysis of the augite yielded:

SiO_2	Al_2O_3	Fe_2O	FeO	CaO	MgO	K_2O	Na_2O	H_2O	Total
53.19	2.38	9.25	5.15	17.81	9.43	.38	2.63	.01	= 100.23

The rock, which is an augite soda-granite, has the following composition:

SiO_2	Al_2O_3	Fe_2O_3	FeO	CaO	MgO	K_2O	Na_2O	H_2O	P_2O_5	Total
66.84	18.22	2.27	.20	3.31	.81	2.80	5.14	.46	tr	= 100.05

[6]Bull U S. Geol. Survey, No. 107.

[7]Amer. Geol., XI, 1893, p. 383.

Petrographical News.—In a series of articles recently published Vogt[8] discusses the formation of oxides and sulphide ores around basic eruptive rock bodies, describes all the known occurrences of the nickel sulphides with reference to their mode of origin, and reviews critically the literature treating of the differentiation of rock magmas. He shows that the nickel ore deposits that are peripheral must be due to differentiation of rock magmas. He further shows that the laws governing the processes of differentiation are very complicated and that neither Soret's principle nor any other single physical or chemical principle will satisfactorily explain the phenomena.

Dr. G. H. Williams[9] reports the occurrence of volcanic rocks at many localities in the eastern crystalline belt of North America. The rocks in question comprise tuffs, glass breccias, devitrified obsidians and fine grained crystalline flow rocks with many of the characteristics of modern lavas. All these have heretofore been regarded as sedimentary in origin by most of the geologists who have studied them. The author gives his reasons for concluding that they are volcanic, and declares that, not before their true character is recognized will the structure of the crystalline areas of the Appalachians be correctly understood.

Lang[10] discusses the conclusions of Rosenbuch[11] with respect to the chemical nature of the crystalline schists, and criticizes Linck's principles governing the mineralogical composition of eruptive rocks. In his article, which is well worth reading, the author shows conclusively that the mineral composition of rocks is not determined by their chemical composition.

[8]Zeits f. prakt. Geol., 1893, Jan., April.
[9]Journ. of Geol., Vol. 2, p. 1.
[10]Min. u. Petrog. Mitth., XIII, p. 496.
[11]Cf. American Naturalist, 1891, p. 827.

GEOLOGY AND PALEONTOLOGY.

The Cambrian Rocks of Pennsylvania from the Susquehanna to the Delaware.—Mr. C. D. Walcott has published his notes on the basal quartzites and limestones of the lower Paleozoic rocks that extend across Pennsylvania, from the Susquehanna river to the Delaware river, and across New Jersey to Orange County, New York, on the north, and into Chester County, Pennsylvania, on the east. The paper is concluded with the following brief summary of the results of the author's observations:

"The discovery of the Olenellus or Lower Cambrian fauna in the Reading sandstone practically completes the correlation of the South mountain, Chickis and Reading quartzites of Pennsylvania, and establishes the correctness of the early correlations of McClure, Eaton, Emmons and Rogers. They all considered the basal quartzite as the same formation from Vermont to Tennessee; and the discoveries of recent years have proven that the basal sandstone of Alabama, Tennessee and Virginia (Chilowee quartzite); Maryland, Pennsylvania and New Jersey (the Reading quartzite); New York and Vermont (Bennington quartzite); were all deposited in Lower Cambrian time, and that they contain the characteristic Olenellus fauna throughout their geographic distribution. The superjacent limestones carry the Olenellus fauna in their lower portions, in northern and southern Vermont, eastern New York, New Jersey and Pennsylvania. To the south of Pennsylvania the lower portions of the limestones appear to be represented by shales, and the upper and middle Cambrian faunas are found in the lower half of the Knox dolomite series of Tennessee, and they will probably be discovered in the same series in Virginia and Maryland, when a thorough search is made for them. The same may be predicted, but with less assurance, for the northern belt of limestone crossing Pennsylvania and into New Jersey, as the limestones between the Olenellus zone and the Trenton zone represent the intervals of the middle and upper Cambrian and lower Ordovician, or the Calciferous and Chazy zones, of the New York section. The working out of the details of this section in southeastern Pennsylvania is an interesting problem, left for solution to some geologist who has the necessary paleontologic training and who will not be discouraged by the prospect of a good deal of hard work before the desired result can be obtained."

"The problem of where to draw the line in this series of limestones, on a geologic map, between the Cambrian and the Ordovician, is one that will seriously embarrass the geologist, but I anticipate that either lithologic or paleontologic characters will be discovered by which the two groups can be differentiated. If not, the limestones must be colored as one lithologic unit or formation and the approximate line of demarkation between the Cambrian and Ordovician indicated in the columnar section accompanying the legend of the map."

Geology of Bathurst, New South Wales.—Bathurst is the centre of a region of considerable geological importance, and geologists are indebted to Mr. W. J. C. Ross for a detailed account of the formations of that district. The Bathurst Plains is a tract of undulating country surrounded by hills. The Plains form an extensive granite area estimated at 450 square miles, while the hills are of metamorphic rock, probably all Silurian. To the east of Bathurst they are backed by an escarpment of Devonian quartzites and sandstones. A few of the western hills are capped by basalt resting on Gravels, indicating volcanic eruptions in the district.

In discussing the age of the Granite, the author states that it is newer than the Silurian, but its relative age with respect to the Devonian is uncertain. He is inclined to think that there have been two intrusions, one subsequent to the Silurian and prior to the Devonian; and the second disturbed the Devonian strata, converting the sandstones into quartzites. A series of veins which traverses the central mass of granite is probably connected with the second intrusion. (Quart. Journ. Geol. Soc., Vol. L, 1894.)

Fossil Tipulidae.—In a paper on Tertiary Tipulidae recently published by Samuel H. Scudder, the author describes twenty-nine new species of 10 genera of Limnobinæ and twenty-two new species of 5 genera of Tipulidæ from Florissant, Colorado, only. From facts now known Mr. Scudder concludes that three principal insect localities in western Colorado and Wyoming are deposits in a single body of water, the ancient Gosiute Lake. To the fauna of these deposits he applies the term Gosiute Fauna, in distinction from the Florissant or Lacustrine Fauna in central Colorado. No single species of the Lacustrine fauna occurs in the Gosiute, and among the few genera found in two of the localities of the Gosiute fauna, the species of each locality are distinct from those of the other.

As a summary of general results obtained from the study of these remains, Mr. Scudder submits the following propositions:

1. The general facies of the Tipulid fauna of our western territories is American and agrees best with the fauna of about the same latitude in America.

2. All the species are extinct.

3. No species are identical with any of the few described European tertiary Tipulidae.

4. Of the Florissant genera, eight out of fifteen are extinct.

5. All the existing genera, except Cladura (American) of the American tertiaries are genera common to the north temperate zone of Europe and America, and are generally confined to those regions. Hence a similar climate is inferred; at least, there are no certain indications of a warmer climate.

Mr. Scudder is fortunate in having such beautifully preserved specimens with which to illustrate his paper. The delicate appendages, the markings and venation of the wings, and even the facets of the compound eyes are shown. The reproduction of the drawings of such delicate fossils reflects great credit upon the lithographer. (Proc. Amer. Philos. Soc., Vol. XXXII.)

Diatoms.—A deep-sea dredging in the Atlantic Ocean, off Delaware Bay, yielded 145 species of diatoms comprising not only marine forms, but a large number that are known to be fresh-water, and some found hitherto only in a fossil state. They were submitted to Mr. Albert Mann for examination, who reports an entire absence of new species. This fact, taken in connection with the depth of the water (318 fathoms), and the number and variety of species, leads the author to conclude that the deposit is composed of fine detritus sifted down upon the sea bottom, and conveyed there by currents from a considerable distance. A list of the genera and species is given, with references to the drawings and descriptions in published works by which they were identified. (Proceeds. U. S. Natl. Mus., 1893.)

Scott on Agriochoerus.—Some fragmentary skeletons of Agriochœrus, associated with the teeth from the White river bad lands of South Dakota, have confirmed a conjecture made by W. B. Scott that Artionyx O. & W. is a synonym of Agriochoerus Leidy. This new material permits Dr. Scott to determine the relation that Agriochœrus bears to the Oreodontidæ, by comparing the points of resemblance and

difference. These are given in detail and then summarized up in the following paragraph:

"In brief, the dentition and skeleton of Agriochœrus shows a large number of close correspondences with the oreodonts, and especially in those particulars in which that group differs from other artiodactyl families. On the other hand, there are significant deviations from the oreodonts, which are to be found more particularly in the structures correlated with the curious change in foot structure. It seems on the whole highly probable that the two families are not distantly related, especially if the somewhat intermediate character of Protoreodon be considered."

The conclusion arrived at by Dr. Scott as to the systematic position of Agriochœrus is that it is the last term in a succession of species which form a curiously specialized offshoot of the Oreodontidæ, its divergences from that family being principally the results of a change in the functions and uses of the feet. (Proc. Amer. Philos. Soc., Vol. XXXIII, 1894.)

The Atmosphere as a Factor in Dynamical Geology.— The line of inquiry pursued by Mr. J. A. Udden, concerning the work performed by the winds of the atmosphere is important since this subject has not received any searching attention from the geologists of this country. The author states a series of laws which appear to govern aerial erosion, transportation and sedimentation in general, and gives the data from which these laws are formulated. The similarities and differences of wind and water erosion and transportation are pointed out, and estimates, based on experiments, of the relative values of the work accomplished by each. From these considerations important deductions are drawn. (1) Since the velocities in the atmosphere are greater than those in water, the distances over which materials may be transported in it are correspondingly greater. (2) The depth of the aerial ocean renders it but little dependent in its movements on the elevations of the land. (3) While the conditions requisite for aerial erosion are limited to rather small areas on the land of the globe, deposition is much more general and widespread. Hence accumulations of atmospheric sediments are insignificant, as a rule, only accumulating in exceptional cases.

In conclusion, Mr. Udden suggests that from a dynamical point of view the wind theory would appear to furnish an adequate explanation of the occurrence of the loess in the Mississippi valley, at least as to

most of its phases, and gives the following facts as the basis of the suggestion:

"The recent denudation of the western plains, of the bad lands, and of the Cordilleran plateau is extensive enough to furnish the materials many times over. The different rocks in these regions, and the changeability of the atmospheric currents would combine to bring together and thoroughly mix a variety of materials, like those of which the loess is composed. The winds would naturally distribute over wide areas the heterogeneous but uniform mixture thus produced. When not taken close to exposures of other materials ninety-nine per cent. by weight, of the loess, is composed of particles below the size of .1 mm., and it contains only a small proportion of the finest materials common in clays and residuary earths, just as must be the case in an atmospheric sediment. It is best developed along the westernmost north-and-south drainage valley, that of the Missouri-Mississippi river. Almost everywhere it is heaviest nearest the water-courses. (Journ. Geol., Vol. II, 1894.)

Geological News. PALEOZOIC.— According to Mr. Winslow, the Coal Measures of Missouri occupy the whole western and northwestern portions of the State and embrace an area of 25,000 square miles. This region is a plateau of moderate elevation in which denudation has not progressed very far. The strata have a slight dip to the west. Their estimated maximum thickness is 1900 feet. The coals occur in basins of limited dimensions, and are chiefly bituminous in character. The beds range in thickness from one inch to about five feet.

MESOZOIC.—Forty-six additions have been made to the Cretaceous paleobotany of Long Island through the researches of Prof. Hollick. Of these nine are recognized as new species and are described and figured in the Bull. of the Torrey Botanical Club for 1894.

A new Plesiosaur, *Cimoliosaurus caudalis*, is described by Captain Hutton. The specimen, now in the Canterbury Museum, was found in the Cretaceous rocks near the Waipara river in New Zealand. It represents an animal about the size of *Pleisosaurus australis*, and is distinguished by the long and powerful tail. (Trans. New Zeal. Inst., 1893.)

Two new and interesting forms of Reptiles have been added to the group from the Elgin Sandstone described by Prof. E. T. Newton. One

is a small Parasuchian Crocodile, allied to Stagonolepis, and is named *Herpetosuchus grantii;* the other reptile Prof. Newton considers intermediate between the Dinosaurians and Crocodilians, and refers it provisionally to the Theropodous Dinosauria under the name *Ornithosuchus woodwardii.* (Proceeds. Roy. Soc., Vol. 54, 1893.)

CENOZOIC.—The reports upon evidence as to glacial action in Australia are as follows: In Queensland and New South Wales, while there is both stratigraphical and biological evidence of a Pluvial epoch, it cannot yet be demonstated whether this epoch belongs to Plistocene or Pliocene time. For Victoria the evidence is equally unsatisfactory. In Tasmania and South Australia glacial action is demonstrated beyond a doubt by the researches of Mr. Johnson, Mr. Montgomery and Prof. Tate. In New Zealand, according to Captain Hutton, the evidence is confined to moraines, surface-till and "roches moutonnées." These indicate that during the ice-age there was an extension of the valley glaciers of the South Island, but there is no proof that they reached the sea. (Proc. Austral. Assoc. Adv. Sci., Adelaide Meeting.)

Mr. E. H. Williams' investigations of the extramorainic drift between the Schuylkill and the Delaware, result in the conclusion that the great moraine was formed immediately after the withdrawal of the ice from the Lehigh, and that it and the extramorainic deposits of the region were part of the same ice invasion, which was of recent age and short duration. (Bull. Geol. Soc. Am., Vol. 5, 1894.)

A tabulated list of the species of Coleoptera prepared by Dr. Scudder shows the effect of the Glacial Period on the present fauna of N. America. The list comprises the species east of the Rocky Mountains, with the exception of the "barren ground" of the high north, the immediate vicinity of the Rocky Mountains and the extreme south of Florida and Texas. West of the Sierra Nevadas the region is limited on the south by Los Angeles, and on the north includes Vancouver Island. In both of these areas, one of which may be termed the glaciated, the other the driftless, a comparison is instituted between the northern and southern regions of each to discover how many genera and species are common to both, and how many peculiar to each. In the eastern area the terminal moraine is the dividing line; in the western, the northern part of California. Finally, the results of these comparisons are balanced with each other. This, according to the

author, should be a guage of the effect of the Glacial Period upon the present faunal distribution of life. The tables indicate that on the whole the fauna of the East has nearly or quite recovered from its enforced removal from the northern States and Canada at the time of the Glacial Period, and that the Glacial influence is seen now only in minor features, such as boreal faunas lingering in favorable spots amid temperate surroundings, and the similar features induced by the latitudinal trend of our great mountain chains. (Am. Journ. Sci., Vol. XLVIII, 1894.)

Among the fossils recently found in the cavern de L'Herm (Ariège), France, are two that M. Boule considers worthy of special attention. The first is the lower jaw of a Glutton (*Gulo luscus*), the other the left inferior mandible of a *Felis* of enormous size. A comparison of the former with fossil Gluttons from other caverns in France, and the Ferest-bed of England, shows a difference in size only. This, M. Boule thinks, does not warrant the new species name, *Gulo spelæus*, applied to it by Goldfuss. M. Boule is opposed also to making a distinct species of the Cave Lion, preferring to consider it a varying form of *Felis leo*, and agrees with the English paleontologists in designating it *Felis leo* var. *spelæa*.

ZOOLOGY.

A New Etheostoma from Arkansas.—*Etheostoma pagei* sp. nov. Head 3½ in length of body; depth 4 to 4¼; eye 3½ in head; snout 3½; dorsal fin with nine or ten spines and 12 or 13 soft rays; anal spines 2; soft rays 7; scales 8–56 to 61–13.

Body robust, snout abruptly decurved but not blunt; mouth rather large terminal, maxillary reaching vertical from pupil; premaxillaries not protractile; lips thick; gill-membranes not connected; cheeks, opercles and breast naked; nape scaled: lateral line imperfect, developed on only about 12 scales.

Color of male: belly bright red, extending on sides to upper rays of pectoral fins; above the red is a yellowish band on the sides about as wide as diameter of eye; upper part of body olivaceous with darker markings, each scale being provided with a black spot, these making faint lateral streaks along the rows of scales, about 9 dark blotches on the side, resembling faint bars. Caudal and soft dorsal fins barred; pectorals faintly barred; anal ventrals plain; a dark numeral scale. The female has the underparts whitish, the sides olivaceous, much mottled with darker; otherwise as in the male.

Length, 2 inches.

Only the types known. Two specimens taken in the spring branch on the U. S. Fish Hatchery grounds, at Neosho, Missouri.

(Named for William F. Page, Superintendent of U. S. Fish Hatchery, Neosho, Missouri.)—S. E. Meek.

Immunity of Salamanders in Respect to Curare.—In a paper read before the French Academy of Sciences, March 14th of this year, MM. C. Phisalix and Ch. Contejean demonstrated that salamanders have the power of resisting, to a remarkable degree, the action of certain poisons, particularly that of curare. A salamander weighing 28 grammes, was completely curarised only after receiving 43 millegrammes of curare, a quantity sufficient to poison 80 frogs. This immunity exists, but to a less degree, in the larva of the salamander, and to a still less degree in the tadpole of the frog. In order to study the cause of this immunity, the authors undertook a series of experiments. Their researches were conducted on the theory that there might exist a relation between the presence of venomous glands and this im-

munity, since the resistance of the toad is greater than that of the frog. In such a case, the immunity of the salamander would be due to the presence in its blood of a substance which would be an antidote or would neutralize the effects of curare. To verify this hypothesis, they innoculated a frog with the blood of a salamander, and obtained the following results:

1. The mixture of the blood of a salamander and curare in the proper proportions does not affect the frog.

2. The blood of the salamander provokes a physiological reaction antagonistic to curare.

These results show that the blood of the salamander contains a substance anti-toxic to curare; this substance exercises a protective action not only over the animal which secretes it, but also over the frog, in which it produces a true physiological reaction against curare.

The experiments of MM. C. Phisalix and Contejean were made in the laboratory of comparative physiology which is in charge of M. Chauveau, of the Museum of Natural History of Paris. (Revue Scientifique, 1st Sept., 1894.)

List of Ophidia found near Vincennes, Indiana.—I do not offer the following as a complete list of the snakes to be found in the neighborhood of Vincennes, but have included only such as I have taken myself. The region was once a very paradise for the herpetologist, but in the past few years many large swamps have been drained and cleared and animals once common are now rare, if not wholly exterminated. Still a more careful search would doubtless lengthen my list considerably.

The *Ancistrodon contortrix*, *Sistrurus catenatus* and *Crotalus horridus* were certainly once abundant, and are still *reported* as numerous, though I have never succeeded in finding a specimen of any one of them, and therefore do not include them in my list.

1. *Carphophis amoena* (Say), found under overhanging rocks.
2. *Farancia abacura* (Holb.), swamps.
3. *Bascanium constrictor*, numerous.
4. *Diadophis punctatus* (Linn.) found in rotten logs; rare.
5. *Liopeltis vernalis* (DeK.), abundant.
6. *Cyclophis aestivus* (Linn.), abundant.
7. *Storeria dekayi* Holb., among high grass in swamps.
8. *Storeria occipitomaculata* (Storer), stony ground.

9. *Coluber vulpinus* (B. & G.), pugnacious and regarded with superstitious dread.

10. *Coluber guttatus* (Linn.), found in dusty roads; enters yards and gardens at night.

11. *Coluber obsoletus* (Say), decidedly reddish from the blotches on base of scales. Have found it only on trees. Hisses with considerable force. A captive ate sparrows, but declined mice and eggs.

12. *Natrix leberis* (Linn.), "striped water snake."

13. *Natrix kirtlandii* (Kenn.), "spread head;" rare.

14. *Natrix sipedon* (Linn.), large; typical variety of our most common snake; variously colored. I found one that would flatten its head and anterior portion of its body like the *N. kirtlandii* or the *Heterodon platirhinus*. I have seen the two extremes of color, the reddish brown and the black spotted in the brood of one female captive.

15. *Heterodon platyrhinus*, common. A friend found a spotted and a uniformly colored specimen copulating and kept them, hoping to raise a family of cross breeds, but his neighbors threatened to prosecute him for keeping such venemous serpents in town, and at length some one broke open his box and killed the "deadly spreading adders." The snakes were strictly diurnal in their habits. They were voracious and preferred toads, but when pressed by hunger would eat frogs and small snakes.

16. *Ophibolus doliatus* (Linn.) common. A boy killed one in the woods, and I went out to examine it, and found beside the dead snake a live one of the same species. It was examining the body and showed fight when disturbed. Was it a mourner guarding the corpse, or a ghoul disturbed at its feast? I do not know.

17. *Ophibolus getulus*, less common.

18, 19, 20. *Eutainia saurita, radix* and *sirtalis*, the latter in great variety.

Mr. Robert Ridgway says that he was informed that the *Ancistrodon piscivorus* (LaC.) was abundant about Vincennes. He was probably misinformed.

The *Natrix sipedon* is called the "water moccassin" in this locality, and is much dreaded. A man near here is reported to have died recently from the effects of its bite, aud, strange to say, this story is believed.

The coral snake, *Elaps fulvius*, has been twice reported from this State, but no one in this locality, so far as I can learn, has ever heard of such an animal.—ANGUS GAINES.

38 Locust St., Vincennes, Ind.

Zoological News. — Mollusca. — According to MM. Bornet and Flahault, the chief cause of the disappearance of shells in quiet bays where they are not subject to wave action is the constant gnawing away of the calcareous matter by shell-boring algae and fungi. Ten genera of boring plants are described, and, in some cases, the life-histories are narrated. (Bull. Soc. Bot. France, t. 36.)

Pisces.—The Bull. U. S. Fish. Com. for 1892 includes a paper by Dr. Eigenmann on the viviparous fishes of the Pacific Coast of North America. The author reviews the Embiotocidae, gives a bibliography of the viviparous fishes, and a detailed accout of the development of Cymatogaster from fertilization to hatching, and the details of the development of the intestine and Kupffer's vesicle. Outlines of the post-embryonic development are also presented.

According to Dr. Gill, the proper generic name of the Tunnies is Thynnus. A discussion of the question is followed by a list of the synonyms. (Proceeds. Natl. Mus., Vol. XVI, No. 965.)

The same author has published a provisional arrangement of the families and subfamilies of fishes which includes the names of the proposers and modifiers of family names with the dates of naming. (Sixth Mem., Vol. VI, Natl. Acad. Sciences.)

Mammalia.—Dr. J. A. Allen calls attention to the cranial variations due to growth and individual differentiation, and instances the species *Neotoma micropus* as a case in point. In a series of fifty skulls of this species it would be easy to select extremes that depart so widely from the average in one or more characters that they might readily be supposed to represent distinct species. Hence the determination of the status of a species described from one or two specimens must depend upon the subsequent examination of a large amount of material bearing upon this and its closely-related forms. (Bull. Am. Mus. Nat. Hist., Aug., 1894.)

ENTOMOLOGY.[1]

Biology of the Glowworm.—Some interesting observations on the New Zealand Glowworm (*Bolitophila luminosa*) are recorded by A. Norris.[2] The larvæ secrete a mucus, on which they slide, leaving a mucus track like the snail. The mucus is also used to make luminous webs. "When the larva is making a fresh web, it raises its head and the first four or five segments in the air, and reaches round about till strikes something. It then draws its head back a little way, thus making a very fine thread of mucus. It then passes it to the thick mucus on the first segment, then slides out a little way and makes another thread on the other side in the same way, fastening each to the thick mucus on the body. When it has made a sufficient number of these braces, it begins to make the strings of beads which hang downward from these braces by gliding out on the braces and lowering its head and about half the body. It then works its head up and down as if to vomit. You can see the mucus gathering on the body. Then it draws its head right back into the first two segments, as if it were turning inside out. It then catches hold of the mucus on the edge of the segment and forces it forward. Now the head is out straight, with a large drop of mucus all round it, like a drop of water. Then it draws its head gently out of the mucus, thus making a short, fine thread from it. It then makes another drop and another short thread; then a drop and so on until it has made several of these pendents of beads, which vary in length. I have seen them from one inch to four or five inches." In the small caves where the larva lives, these webs reflect the light from the shining glowworm.

Mr. Norris believes the webs are formed to entangle insects and Crustacea, as he has found many of these dead in the webs, and some were hollow as if the body contents had been eaten. "When the insects are alive, the larva may be seen smothering them with mucus." One was also seen actually feeding on the inside of a Crustacean.

Embryonic Development of Tortrix.—As a result of recent studies of *Tortrix ferrugana*, J. W. Tutt says:[3] "It appears certain that

[1] Edited by Clarence M. Weed, New Hampshire College, Durham, N. H.

[2] Ent. Mon. Mag., Sept., 1894.

[3] Ent. Record, V, 215, Sept., 1894.

there are in its embryo four distinct cephalic segments, which, in the early stages of embryonic development are large (compared with the other segments which are developed later), and are made still more distinct by the possession of buds or processes. As development goes on, these four segments get welded together, and become not only proportionately, but absolutely smaller than at first. When the abdominal segments are in course of development, there certainly appear to be eleven of them. The three thoracic segments are, in the early stages of development, large and almost circular, and the next segment (1st abdominal) is of the same character, looking at this time much more like a thoracic than an abdominal segment, though it has, of course, no appendages. The eye spots in this species are remarkably conspicuous as two reddish patches, and become apparent at about the same time that the abdominal segments first show. As development proceeds, the cells of the developing *T. ferrugana* appear to be stained here and there with red patches, especially along the ventral area of the alimentary canal, but differently distributed in different examples. These afterward spread over the whole of the embryo." It was suggested that this color was connected with the skin. The thoracic legs develop when the embryo begins to show segmentation. The embryo is then somewhat curved, "with the head slightly bent round toward the anal extremity, but with the legs outside, *i. e.*, the larva is bent back upon itself so as to form a curve agreeing roughly with the curvature of the shell, with what afterwards becomes the ventral surface of the larva outside and the dorsum towards the centre. The embryo then gradually changes its position, the anal segments curling around and being pushed by the growth of the preceding abdominal segments slowly up the ventral surface of the larva whilst the dorsum gets pushed out, as it were, towards the centre of the egg. During this process the embryo becomes shaped something like the letter S, the movement continuing until a complete reversal of the embryo has been affected."

The Rabbit Bot Fly—Cuterebra cuniculi Clark.—We are greatly indebted to Mr. Percy Selous, of Greenville, Mich., for specimens, notes and drawings of the rabbit bot fly, *Cuterebra cuniculi.* The larva of this species is quite often taken from the rabbit, though few persons are successful in rearing the fly from the larva, and Mr. Selous is to be congratulated on his success.

The notes of Mr. Selous on the rearing of the bot are as follows: 'The ripe larva dropped from a rabbit I shot last September. The

grub was between the fore legs rather high up, and when expelled, the pocket in which it had lived had just the appearance of the interior of the anus in mammals. I took the grub home and let it burrow into a box of earth from which the fly emerged, something like what I have shown in my sketch, on the 22d of May. As a naturalist, I am deeply interested in such matters as this, and the fact that I have been able to follow my bent in South Africa, South America and many other countries does not tend to make me less so."

The grub, as shown by Mr. Selous in the accompanying drawings, is over an inch and a half long and nearly an inch broad. The pupa case is very thick and heavy, with blunt, thick-set tubercles covering the outside of it. The fly has the head, legs, ventral region and all of the abdomen, except the first segment, black. The thorax and the first segment are thickly covered with fine silken yellow hair. The wings are dark and smoky.

This species of grub is quite common in the front quarters of rabbits this time of the year, and no doubt if more hunters and naturalists knew of its presence in the rabbit and how to save and rear the grub, more of the flies might be reared. Mr. Selous has made a start; who will follow?—G. C. DAVIS. Agr'l College, Mich.

Insects' Vision.—Mr. A. Mallack adds another paper to the voluminous literature of vision in insects.[4] His observations and calculations, as we learn from the "Journal of the Royal Microscopical Society," have led him to conclude that "Insects do not see well; at any rate, as regards their power of defining distant objects, and their behaviour, favors this view. They have, however, an advantage over simple-eyed animals in the fact that there is hardly any practical limit in the nearness of the objects they can examine. With a composite eye, the closer the animal the better the sight, for the greater will be the number of lenses employed to produce the impression. In the simple eye, on the other hand, the focal length of the lens limits the distance at which a distinct view can be obtained. Of the various forms of insects examined, the best eye would give a picture about as good as if executed in rather coarse wool-work, and viewed at a distance of a foot."

Chinch Bug Diseases.—Professor F. H. Snow makes an elaborate report[5] of his recent extended experiments with the fungus Sporo-

[4] Proc. Roy. Soc. Lond., LV, pp. 85–90.

[5] Univ. of Kansas Exp. Station, Third Rept., 1894.

trichum which causes a fatal malady of chinch bugs. More than three thousand experiments are reported, more than half of which were believed to be successful. The great difficulty in the practical use of the fungus was the dry weather, during which no progress could be made.

Greenland Insects.—In reporting on a small collection of Microlepidoptera from McCormick Bay, Professor C. H. Fernald remarks:[6] "One of the most interesting features of this small collection is the very dark color of the insects. The specimens of *Laodama fusca* and also of *Pyrausta torvallis* are much darker than any I have ever seen before, either of those taken in New England or Labrador, but when we recall that Mr. Mengel states that they rest on the lichen-colored rocks, we have not far to seek for the cause of this dark color." These lichens are dark brown or black, and the laws of natural selection would lead to the establishment of a dark race through the elimination of the light-colored individuals. Professor Fernald describes one new species —*Sericoris mengelana.*

Habits of Larval Coleoptera.—F. M. Webster reports[7] that larvæ of *Leptotrachelus dorsalis* Fab. feed on larvæ of *Isosoma tritici* Riley, and pupate in wheat stubble, after plugging up open end. The larva of *Phalacrus politus* Mels. develops in smut of rye and Indian corn. A female *Neoclytus erythrocephalus* was seen ovipositing in trunk of dead apple tree, and *Bruchus mimus* Say was reared from seeds of *Cercis canadensis.* The larva of *Disonycha caroliniana* Fab. feeds on foliage of *Portulaca oleracea,* and *Apion segnipes* Say develops in pods of *Tephrosia virginiana.*

Biology of the Horse Bot.—From observations on the eggs of the common horse bot fly, Professor H. Osborn reaches the following conclusions:[8] "(1) That the eggs do not hatch, except by the assistance of the horse's tongue. (2) That hatching does not ordinarily occur within ten or twelve days, and possibly longer, or, if during this period, only on very continuous and active licking of the horse. (3) That the hatching of the larvæ takes place most readily during the third to fifth week after deposition. (4) That the majority of the larvæ lose their vitality after thirty-five to forty days. (5) That the larvæ may retain their vitality and show great activity upon hatching

[6] Ent. News, V, 132.
[7] Ent. News, V, 140.
[8] U. S. Dept. Ag., Div. Ent., Bull. 32, p. 48.

as late as thirty days after the eggs were deposited. (6) That it is possible, though not normal, for eggs to hatch without moisture or friction. (7) That in view of these results, the scraping off of the eggs or their destruction by means of washes will be very effective, even if not used oftener than once in two weeks during the period of egg deposition, and probably, that a single thorough removal of the eggs after the period of egg deposition has passed, will prevent the great majority of bots from gaining access to the stomach."

PSYCHOLOGY.

Subjective Defense in the Lower Animals.—In this paper I use the word "defense" in its broadest sense, not only as the antethesis of offence, but in the sense of protection. The instinct of defense or self protection is greatly developed in the lower animals, so much so, that the observant naturalist finds evidence of it even in microscopic organisms.

On one occasion I opened the burrow of an itch insect (*Acarus*), and allowed the serum to float out the little parasite which dwelt therein. I could, with the assistance of a good French lens (X 15 diameters) closely see it moving along on the surface of the skin. I touched it with the point of a needle, and at once it stopped all motion and feigned death. In a few moments the little animal regained its feet and slowly moved off, only to again feign death as soon I touched it with the needle. This habit of letusimulation (*letum*, death, and *simulare*, to feign), I have noticed in much lower animals, and am convinced that they make use of this strategy for the purpose of self-protection.

A minute fresh water animacule (rhizopod) retracts its hair-like feet, feigns death and sinks, whenever its enemy, a water louse, approaches it. I have witnessed this occurrence on several occasions, and have, likewise, seen Rhizopoda return to their feeding-grounds as soon as their enemy has disappeared. A fresh-water worm practices letusimulation when approached by the giant water-beetle, and many of the microscopic infusory animalcules likewise make use of the same sagacious subterfuge when surprised by their enemies. Death-feigning is practiced by most of the slow-moving beetles, especially is this noticeable in the tumble-bug and bombardier-beetle. This last-mentioned insect, notwithstanding its disgusting odor, is the favorite food of some of the birds, noticeably, the jay and the cardinal. They will not touch it if killed and offered to them; numerous experiments have taught me that these birds regard it as unsuitable food unless taken alive. There is, probably, some *post-mortem* change in the juices of the beetle, which renders it unpalatable. The object of letusimulation in this beetle is made perfectly obvious. In a paper on "Animal Letusimulants," published in the March number of *Atlantic Monthly*, I account for the origin of death-feigning in animals, as follows: "Most animals are slain for food by other animals; there is a continual struggle for existence. Most of the carnivora and insectivora prefer freshly killed food

to carrion. It is a mistake to suppose that carnivora prefer carrion, though the exegencies of their lives in their struggle for existence often compels them to eat it. Dogs will occasionally take it, but sparingly, and apparently as a relish, just as we ourselves eat certain odoriferous cheeses. Carnivora and insectivora would rather do their own butchery; hence, when they come upon their prey seemingly dead, they will leave it alone and go in search of other quarry, unless they are very hungry. Tainted flesh is a dangerous substance to go into most stomachs, certain ptomaines rendering it, at times, virulently poisonous. Long years of experience have taught this fact to animals, therefore, most of them let dead or seemingly dead creatures severely alone."

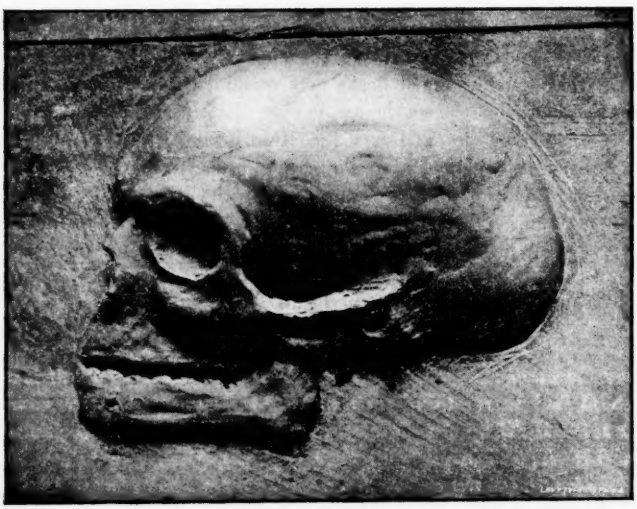
The larvæ of many of the moths and butterflies are pronounced letusimulants. In fact, I may say that all edible larvæ practice this cunning trick. Take a caterpillar in the fingers, or touch it with a stick, and it will at once curl up and feign death. They invariably assume that shape which *rigor mortis* occasions in real death. Mr. George D. Mattingly, of Owensboro, Ky., related to me the following instance of letusimulation in a caterpillar: This larva had fallen accidently into a conical depression in a sand-heap. It attempted to crawl up the north side of the pit, but, owing to the rolling of the sand beneath its feet, slipped back. It then tried the west side, and almost reached the top. Here, however, it dislodged a lump of agglutinated sand-grains, and rolled, together with the lump, to the bottom of the hole. The caterpillar, imagining the clod of sand to be an enemy, at once curled up and feigned death. It remained quiescent for several minutes, then tried the south side, mounted safely to the top, and went on its way rejoicing. The fact that this larva tried three different routes before reaching the top, shows a high degree of conscious determination. Many of the thousand-legs have this habit, and practice it whenever the occasion demands. The toad is a gifted letusimulant; when it sees that it cannot escape its enemy, it ducks its head, draws in its legs close to its body, and feigns death. It may be turned upon its back, or thrown to some little distance, or handled freely, yet it will give no sign of life, unless pain be inflicted.

Some of the snakes have acquired this habit, notably the moccasin (*Ancistrodon*). Last August I discovered a moccasin in an open field where there were no sheltering rocks, bushes, weeds, etc. I teased it for quite a while with my stick, driving it back whenever it attempted to escape. Suddenly it bent its body backwards and seemingly inflicted a severe bite on its own back. Immediately it turned over on its back, belly upwards, to all appearances dead. I retired some little

distance and seated myself on the ground. After five or six minutes the snake turned upon its belly and glided rapidly away.

Mr. John Cheatham, of Owensboro, Ky., informs me that on September 23, he and Mr. John Harrison came suddenly upon a black or blowing-viper in a field. Mr. Harrison remarked that he could make the snake commit suicide; whereupon, he picked up a long stick and began to annoy it, driving it back whenever it endeavored to escape. In a few moments "the snake bent back and drew his widely open mouth violently along his body as if endeavoring to rip himself open. He then turned upon his back and died at once." This act of letusimulation was so perfect that Mr. Cheatham and friend walked away, thoroughly convinced that they had seen a suicide enacted. It is hardly necessary to remark that the snake in question is perfectly harmless, having neither fangs nor poison glands. Many of the higher animals make use of the simulation in order to deceive their enemies or their prey.

The Criminal Skull.—I give a figure of a model in clay of the skull of Jeff. Diggs who died at the age of fifty, having passed, according to his own statement, thirty years of his life in reformatories, workhouses, jails and penetentaries. This model is made to scale and is



The Criminal Skull.

exact in every particular. A Photograph of the original skull does not bring out the detail, hence I made the model in clay. It should have accompanied the text of "The Recidivist," American Naturalist, June, 1894, but an injury to my right hand prevented a completion of the model in time.

POINTS TO BE NOTED.

1. Flattening of the cranial arch.
2. Shallowness of brain-pan.
3. Dolichocephalism.
4. Prognathism.
5. Enlargement of orbital arches.
6. Smallness of orbicular cavities.
7. Highness of cheek bones.
8. Bowing of zygoma.
9. Sagging of occiput.
10. Heaviness and projection of lower jaw.
11. General asymetry of skull.
12. Resemblance to the prehistoric skull of the Man of Spy.

See "The Recidivist" American Naturalist, June, 1894.

JAS. WEIR, JR., M. D.

The Habits of Amblystoma opacum.—I once secured a number of marbled salamanders (*Amblystoma opacum*), and kept themin a small enclosure where they lived under chunks of wood. They did not curl up as they are said to do, but lay stretched out, showing but little sign of life. Their food was larvæ and earthworms; I believe they will not eat flies nor ants. They are so soft, weak and helpless, that I thought that they could not dig deeper than merely sufficiently to hide themselves, but, out of deference to the opinion of Mr. Nicholas Pike, who says that they will burrow to a depth of three feet, I sunk a board two feet deep around their enclosure. I was absent for a time, and returned to find my salamanders missing. On digging carefully, I found unmistakable signs of their burrows extending beneath the sunk board. They had burrowed out and escaped, corroborating two feet of Mr. Pike's story.—ANGUS GAINES.

Habits of Ophibolus getulus.—Early in July I captured an *Ophibolus getulus*, a small but very fine specimen, answering perfectly to the description of the type given by Dr. O. P. Hay, in the Seventeenth Annual Report of the Indiana Geologist.

The little reptile fought fiercely when first picked up, but was perfectly docile the next day. I kept him in an enclosure with a number of other snakes of various species, but he appeared to dislike their society and appeared reluctant to share their bed of loose cotton. He refused all food and took no notice of the earthworms, insects, minnows and small frogs and toads with which my other snakes were fed, and paid no attention to a *Natrix sipedon* much smaller than himself. When placed in a box with a large number of small toads, he appeared frightened and tried to escape. Acting upon a suggestion offered by Professor Cope in his article on "Critical Review of the Characters and Variations of the Snakes of North America," I kept him supplied with a saucer of milk, of which he took no notice.

After he had been in my possession for 25 days, I captured a *Eutænia radix* which I put in the same enclosure. The other snakes paid no attention to the newcomer, but the *Ophibolus* roused at once, as if scenting a natural enemy, and seized the *Eutænia*. The fight was long and fierce, for the *Eutænia* was strong and active, and was five inches longer than his assailant, but the *Ophibolus* gained the victory and undertook the seemingly impossible feat of swallowing his victim. This task occupied the whole night, but he actually succeeded in swallowing the snake five inches longer than himself. This very hearty meal distorted him beyond recognition, and he gave no signs of life except by a slight twitching of the tail. After an absence of some 40 hours I revisited my terrarium, and found that he had disgorged his prey and resumed his proper shape.

Since that time the *Ophibolus* has taken no food, though he is still strong and active; his spots, however, which were originally of ivory whiteness, have assumed a sulphur yellow hue.

I tried placing a looking-glass in my terrarium, and the *Ophibolus* showed signs of excitement at the first sight of his reflection, but afterwards paid no attention to it.

My *Ophibolus getulus*, 12½ inches long, after going fifty days without food, except the one snake which it subsequently disgorged, killed and ate a *Natrix sipedon* over eight inches long, and is doing well.

—Angus Gaines.

ARCHEOLOGY AND ETHNOLOGY.[1]

Indian Corn in Italy.—Some Italian Naturalists like Bonafous (Hist. Nat. Agric. et Economique du Mais, Paris and Turin, 1836) have supposed that Indian Corn (Zea Mays) had grown in Asia or Africa before the Spaniards found it in America, but De Candolle (L'Origine delle piante Coltivate, Milan 1883, p. 519) believes that it came into the Old World from the New after the discovery by Columbus, and that Rifaud, who in 1819 found maize in an Egyptian tomb at Thebes, was deceived by an Arab.

Signor Goiran, of Verona, supposes that the plant was first largely cultivated near Verona about 1647, and Signor Anelli, the inventor of "Anellis maize-bread," informs me that it was not used for human food in the Milanese until about 1817. Harschberger in his recent important investigation of the history of the grain (Zea Mays—A Botanical Study, Philadelphia, 1892) while tracing the source of the American grain to Southern Mexico does not believe in its extra American origin, but whether we may suppose it to have grown in any corner of the Old World before 1492 or not, there is no question that the Spanish discoverers brought specimens of it from America to where it was noticed in cultivation near Seville about 1527. How it got into Italy from Spain, (granted that it came thence) whether directly, or by the roundabout way of Arab commerce through Morocco, Africa and the Levant, no one seems to have informed us, though if by the latter route, we may guess that it found its way into Lombardy through Venice.

However and whenever it appeared on the Lombard plain, the well preserved architectural decorations, frescoes, paintings and book illuminations of the fifteenth and sixteenth centuries in Italy might throw an unexpected light upon the date and direction of its first importation. The frescoes of Mantegna (1451–1517) often adorned with borders of plants and flowers might reveal maize. There is no maize, I am informed, among the plants and fruits painted on the leaf margins of the magnificent 15th century Missal known as the Breviario Grimani by Hans Memling (died before 1499) at the library in Venice; and I failed to find signs of the use of Indian Corn in the farmyard pictures of Jacopo Bassano (1510–1592) at Venice and Verona, or in the throng of stooping figures and animals by him known as "The Fair" at Bassano, where

[1] This department is edited by H. C. Mercer, University of Pennsylvania.

the turkey appears then as new and as American as maize. I found it, however, abundantly used in the Stucco ceiling decorations (by Vittorio, middle of 16th century) of the Villa Masser near Castel Franco.

If there remains any doubt as to the genuine antiquity of the grains in Rifaud's Egyptian tomb no better evidence for or against the American origin of the plant now grown in Europe could be looked for than what these unransacked pictures and ornaments may offer, where at slight pains and by a turn of the head, any traveller will settle the question beyond all dispute if he discovers maize in color or stone before 1492.

While common parlance in the Old World has so often held to a geographical name for the strange grain, dubbing it in Lorraine "Roman grain," in Tuscany "Sicilian grain," in Sicily "grain of India," in the Pyrenees "Spanish grain," in Provence "Barbary or Guinea grain," in Turkey "Egyptian grain," and in Egypt "Syrian grain," these Folk names have seemed by implication to deny, in every case, an American origin to the plant. But the fact in De Candolle's opinion proves no more than that the English name "Turkey" has appeared to deny an American parentage to the familiar *Meleagris gallopavo.*

According to Professor Keller of the University of Padua, the human consumption of maize ceases south of Bologna, and in my conversations with townspeople a slight notion of something ridiculous seemed to attach to the grain, as of a food fit for hogs and cows, rather than men. Notwithstanding this, some of the peasants eat maize in the common form of Polenta (boiled mush) to such an extent in the Novarese, Bergamasco, Milanese, Comasco, Bresciano, and Tremonese, and in Mantua, Veneto and Vercelli[2] that a sickness called Pelagra, showing itself in shrunken skin, emaciation, dizziness, intense thirst, and a desire to plunge into pools of water, is the result.

Leaving out the alcohols, oils, colors and glucose extracted from Italian maize in recent years, the most considerable and important of all the human uses of the grain in Italy is

(1) *Polenta,* the universally mill ground meal boiled with salt and water for half an hour, large doughy loaves of which, saffron yellow or white, can be found in almost any peasant's cupboard from Venice to Piedmont.

Sometimes cut slices of it are found, as I saw them at Venice, fried, like American fried mush.

[2]For this and the following information as to Anellis Bread and Pane Mistura I am indebted to the Rev. Signor Anelli of Monza.

Now and then a little maize meal goes with farina, salt and water into a soup and you have

(2) *Polentina di Cittadella.* The further uses of maize in northern Italy for human food are as follows:

(3) *Pane Giallo,* of Milan, a baked loaf made half of maize and half of wheat meal.

(4) *Pane Mistura,* of Milan and the Veronese, a baked loaf of varied shape made of one-third maize and two-thirds wheat meal.

(5) *Pane Mistura Con Uva* which is No. (4) mixed with rasins.

(6) *Foccacia,* (Fogassa, Verona city dialect; Pissotta or Pinze, Country, Veronese dialect). As I saw it made in a peasant's kitchen near Verona, it is produced as follows: Take one pint of yellow maize meal, mix it with two pints of wheat flour. Pour upon the mixture half a teacupful of melted butter; add then two tablespoonfuls of white sugar and one tablespoonful of soda; this done, pour on gradually about a half a pint of hot water and roll and knead the mass well. Finally having made the dough into a round ball, flatten it into a cake about $\frac{3}{4}$ of an inch thick and 10 inches in diameter, both sides of which are to be well stippled with the point of a knife. Fry it then in a pan greased with about a half a teacupful of butter and raised about two inches over a pile of live but flameless embers.

(7) *Cinquantino* (Zinquantin, dialect Veronese) as eaten near Padua and Verona. This is the young, milky ear of the white variety of maize roasted near the embers.

(8) *Melica Dolce.* A small sugared cake made of maize meal in Milan.

(9) *Pane d'Anelli,* eaten in the Milanese. A mixed bread baked of two-thirds maize and one-third wheat, recently invented by the Rev. Signor Anelli, of Monza, as a cheap substitute for Pane Mistura, and as a cure for Pelagra in districts where peasants who eat maize four or five times a day suffer from the disease.

The two well known and commonly used varieties of maize in northern Italy are the bianco (white) producing a white meal but considered of inferior flavor as polenta, and the rosso (red) with a very brilliant reddish-yellow tinge on the cob, and producing a golden yellow meal.

By the tenth of September the russet fields of the ripening grain are as characteristic of the Lombard plain, as the horizon obstructing locust hedges, or the pollard trees festooned with grape vines. But the ears ripen on clipped stalks and we miss the wigwam shaped stacks of American "fodder." I saw peasants threshing maize with flails near Verona, but could hear nothing of pounding the grain with pestle and

mortar. Hominy large or small and "ash" and "hoe" cakes seemed unknown, and the interesting Mexican edible products of maize like "tortillas," (wafer like cakes of baked maize dough,) or the peppered dumplings called "tomales" had no more place in the Lombard kitchen than the transatlantic art of crushing on metates the water soaked and softened grains. Near Castel Franco, I saw a large bunch of red ears hanging by their twisted husks on the wall of a roadside shrine.

An etymology has been suggested for the name Grano Turco, in the antics of boys when bearded and moustached with maize silk, they mimic the fierce looks of Turks in the high "corn." We cannot think that the Italian lad does not smoke the mock tobacco that must tempt him upon each ear. If he does he apes a habit no less American in its origin than the maize itself. So the American lad playing with a "shoe string bow" on a "corn-stalk fiddle" would turn to Italy for his inspiration.—H. C. MERCER.

MICROSCOPY.[1]

Cytological Methods.—*Lysol.*—Friedrich Reinke[2] calls attention to the antiseptic *lysol* (a solution of Cresol in neutral soap) as a valuable reagent for the nucleus. *It dissolves chromatin*, leaving other elements intact; and it brings out a new element in the nucleus, to which the author gives the name, *œdematin*. This substance appears in the form of granules within the linin mesh-work of the nucleus, remaining after the chromosomes have been completely dissolved. A small salamander larva, for example, left in about 50 ccm. of 10 per cent *lysol* for from 6 to 24 hours, will have its chromatin dissolved, and its œdematin granules rendered visible.

Œdematin shrinks greatly in such reagents as alcohol, chromic acid, and osmic acid, and only now and then appears as a *fine* granular precipitate. In lysol, on the contrary, it swells up under the action of one constituent (the soap solution) and is coagulated by the cresol and thus made distinct. Œdematin corresponds, in part at least, to Heidenhain's *oxychromatin*, Pfitzner's *parachromatin*, and Frank Schwarz's *paralinin*. Reinke remarks that this substance is absent, or nearly so, from ova and spermatozoa. It is well developed in most somatic cells: e. g., epithelium, connective tissue, leucocytes, etc.

In the action of lysol, three stages are to be distinguished: (1) solution of the chromatin; (2) appearance of œdematin granules; and (3) further changes of the œdematin.

The time required to reach the second stage varies with the tissue. The epithelium of the salamander larva requires at least six hours. In connective tissue the second stage is quite short and transitory.

The method does not admit of permanent preparations.

Neutral versus Acid Fixatives for Nuclei.[3]—Professor Altmann claims that the usual acid reagents, among which he reckons sublimate, platinum-chloride, gold-chloride, etc., disturb nuclear structure, reducing the chromatic elements to compact, structureless masses. On the other hand, *neutral* reagents, among which are placed osmic acid, and a mixture of chromic acid with a molybdenum salt, preserve the structure of nuclei. At first sight, and under low powers, nuclei present a homogeneous appearance. But this homogeneity is not

[1]Edited by C. O. Whitman, University of Chicago.

[2]Anat. Anz. VIII, Nos. 16 and 18, 1893, and Arch. f. m. Anat. XLIII, No. 3, 1894.

[3]Altmann. Verhandl. d. Anat. Ges. Mag., 1893, p. 50.

real; for structure is there and it can be made out, although with some difficulty. Cell nucleus and cell body, although chemically different, exhibit the same morphological structure, consisting of *granula* and *inter-granular net-work*. Altmann was able to demonstrate the granular structure of the chromosomes.

Heidenhain (Arch. f. mik. Anat., XLIII, 3, p. 428) maintains, in opposition to Altmann, that with sublimate the granula and net-work are demonstrable; and further, that acid reagents are, after all, superior to neutral reagents.

Iron-hæmatoxylin and Centrosomes.[4]—Iron-hæmatoxylin has been used by Heidenhain in the study of the centrosomes and astrospheres.

The original process, which is also repeated in the new modification, was the following:

Fine sections of preparations in sublimate are fixed on the slide by means of distilled water, dehydrated with alcohol containing iodine, and exposed to a 1½ per cent solution of ammonio-ferric alum.[5] The slide is next washed with distilled water and then placed in a 1½ per cent solution of *Hæmatoxylinum purissimum* (Grübler). The overstained sections are then again treated with the iron-alum solution used before, in order to remove the superfluous color. The process of extraction must be followed under the microscope and continued until the cell protoplasm is completely decolorized, and the chromatin network of the nucleus becomes clear. One may interrupt the differentiating process any moment by washing with fresh water, and then continue it. When the extraction of the stain has been carried far enough, the slide should be washed fifteen minutes in fresh water and mounted in the usual way in balsam.

Heidenhain noticed that when the differentiation was effected quickly the centrosomes were stained in greater number than when the process occupied a long time. It seemed, therefore, that the defects of the method might be corrected if a way could be found by which the decoloring process could be hastened. How could the cytoplasm be freed from the stain in the shortest time? Assuming that a stain acts by chemical combination, it seemed probable that the process of extraction might be hastened, if the receptivity of the cytoplasm could be at least partially saturated before the application of the hæmatoxylin. Accordingly, Heidenhain selected as *preliminary* stains

[4]Arch. f. m. Anat. Vol. XLIII, part 3, p. 434.

[5]The crystals of this salt should be clear violet in color; if they are yellowish and opaque, they have suffered from exposure to air and are no longer fit for use. The solution must be made cold, as the salt is decomposed by heat.

(" Vorfarben ") such as affect the cytoplasm and the nucleus, and leave the centrosomes unstained. Thus the chemical affinities of the centrosomes for the hæmatoxylin would remain at full strength, while those of the cytoplasm and nucleus would be more or less saturated, and to the same extent weakened for the hæmatoxylin. In this way the process of extraction was brought under some control, and the method greatly improved.

Stains reached in this way are called " subtractive."

Bordeau R., Anilin blue and Methyl-eosin were employed as preliminary stains. Bordeaux R. proved to be the best. In preparations that have been successfully differentiated as to the centrosomes, the nucleus and its chromatin are almost colorless, so that the centrosome may be easily studied, even when it lies behind the nucleus. The *nucleoli* remain strongly stained.

The Chromatin.—Heidenhain shows that there are two kinds of chromatin to be distinguished, namely: an *oxychromatin* brought out by *acid* anilin stains (e. g., Rubin S.), and a *basichromatin* which is brought out by *basic* anilin stains (e. g., Methyl green). The " basichromatin " is the chromatin of Flemming and authors in general.

The differentiation of the two chromatins can only be accomplished when the nucleus is exposed at the same time to both *acid* and *basic* anilin colors, as is the case when Biondi's solution and Ehrlich's triacid are used.

If one mixes ammonium vanadate with hæmatoxylinum pur (Grübler) a blue stain is obtained which stains *cytoplasm* and *oxychromatin* strongly, while the *basichromatin* is often left nearly colorless.

The two chromatins probably differ only in the amount of phosphorus present, basichromatin containing more, oxychromatin less.

The Egg-Centrosome.[6]—Dr. H. Mertens finds that the so-called " yolk-nuclei," so generally known in both vertebrate and invertebrate eggs, represent, in the case of the mammals and birds, two very different elements. Sometimes they are chromatin granules eliminated from the nucleus; at other times they represent centrosomes. The identification of these bodies with the centrosome is the point of chief interest. The method employed was as follows: The material was prepared in Hermann's fluid. Three precautions were observed: (1) The object must remain a long time in the fluid—for weeks or even months. (2) Transfer to pyroligneous acid (1–3 ds.). (3) Wash thoroughly in running water.

The preparations were imbedded in celloidin and stained with safranine.

[6]H. Mertens, Arch. de Biologie, XIII, 3, '94, p. 394.

SCIENTIFIC NEWS.

Dr. Carl Röse, so well known for his investigations on the structure and development of the teeth, has issued, in connection with Dr. A. Gysi, of Zürich, a set of twelve microphotographs of the histology of the teeth. The photographs are 18 cm. square, and are sold at 12 marks ($3.00) the set. Dr. Röse's address is Friedrichstrasse, 12, Freiburg i B, Germany.

Professor Lamson Scribner had his entire herbarium which was especially rich in grasses, stored in the Knox warehouse which was burned in August. The entire collection except the genus Panicum was destroyed.

Mr. T. H. Kearney, Jr., has been appointed Curator in the Columbia College New York Herbarium.

Dr. Harrison Allen has resigned the directorship of the Wistar Institute of Anatomy in Philadelphia, and Dr. Horace Jayne has taken his place.

Prof. Chas. T. Prosser has left Washburn College Topeka Kansas, and has taken a position at Union College Schenectady, New York.

The Academy of Sciences of San Francisco has published an illustrated volume of Proceedings consisting largely of important contributions to the zoology of Lower California.

Errata.—In the Article "Abalone or Haliotis Shells of the Californian Coast," on page 858, ninth line from top, "As these strips of solid silver," should read "As thin strips of solid silver."